7 Receiver characteristics

TBD

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective clauses below.

Unless otherwise stated, Channel Bandwidth shall be prioritized in the selecting of test points. Subcarrier spacing shall be selected after Test Channel Bandwidth is selected.

The applicability of receiver requirements for Band n90 is in accordance with that for Band n41; a UE supporting Band n90 shall meet the minimum requirements for Band n41.

With the exception of clause 7.3, the requirements shall be verified with the network signalling value NS_01 configured (Table 6.2.3.3-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and A.3.3, and using the set-up specified in Annex C.3.1.

The minimum requirements specified in clauses 7.5, 7.6, 7.7 and 7.8 for NR band n48 refer to the minimum requirements for NR bands < 2.7 GHz.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks, an in-gap test refers to the case when the interfering signal is located at a negative offset with respect to the assigned lowest channel frequency of the highest sub-block and located at a positive offset with respect to the assigned highest channel frequency of the lowest sub-block.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks, an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency, or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks with channel bandwidth larger than or equal to 5 MHz, the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size W_{gap} for at least one of these carriers j = 1,2, so that the interferer frequency position does not change the nature of the core requirement tested:

$$\mathrm{Wgap} \geq 2\cdot|\mathrm{FInterferer\ (offset)}_{,j}| - \mathrm{BWChannel}(j)$$

where $F_{\mathrm{Interferer\ (offset)},j}$ for a sub-block with a single component carrier is the interferer frequency offset with respect to carrier j as specified in clause 7.5, clause 7.6.2 and clause 7.6.4 for the respective requirement and $BW_{\mathrm{Channel}(j)}$ the channel bandwidth of carrier j. $F_{\mathrm{Interferer\ (offset)},j}$ for a sub-block with two or more contiguous component carriers is the interference frequency offset with respect to the carrier adjacent to the gap is specified in clause 7.5A, 7.6A.2 and 7.6A.3. The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow- band blocking shall be tested separately with a single in-gap interferer at a time.

7.1A General

The minimum requirements for band combinations including Band n41 also apply for the corresponding band combinations with Band n90 replacing Band n41 but with otherwise identical parameters. For brevity the said band combinations with Band n90 are not listed in the tables below but are covered by this specification.

The minimum requirements specified in clauses 7.5A, 7.6A, 7.7A and 7.8A for NR band n48 refer to the minimum requirements for NR bands < 2.7 GHz.

7.1I General

For a Redcap UE the requirements in Section 7 shall be verified with the channel bandwidth up to 20MHz and REFSENS specified in clause 7.3I.

7.2 Diversity characteristics

The UE is required to be equipped with a minimum of two Rx antenna ports in all operating bands except for the bands n7, n38, n41, n77, n78, n79 where the UE is required to be equipped with a minimum of four Rx antenna ports. An exception is allowed for two Rx vehicular UE to be equipped with a minimum of two Rx antenna ports in bands n7, n38, n41, n77, n78, n79. This requirement applies when the band is used as a standalone band or as part of a band combination.

For the single carrier REFSENS requirements in clause 7, the UE shall be verified with two Rx antenna ports in all supported frequency bands, additional requirements for four Rx ports shall be verified in operating bands where the UE is equipped with four Rx antenna ports.

For Rx requirements other than single carrier REFSENS in Clause 7, the UE shall be verified with four Rx antenna ports and skip two Rx antenna ports requirements in operating bands where the UE is equipped with four Rx antenna ports, otherwise, the UE shall be verified with two Rx antenna ports.

The above rules apply for all subclasses with the exception of clause 7.9.

For a Redcap UE the requirements in Section 7 assume that the receiver is equipped with a minimum of single Rx antenna port.

7.3 Reference sensitivity

7.3.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

In later clauses of Clause 7 where the value of REFSENS is used as a reference to set the corresponding requirement:

In all bands, the UE shall be verified against those requirements by applying the REFSENS value in Table 7.3.2.3-1a, Table 7.3.2.3-1b and Table 7.3.2.3-1c or Table 7.3.2.3-1d with 2 Rx antenna ports tested;

For bands where the UE is required to be equipped with 4 Rx antenna ports, the UE shall additionally be verified against those requirements by applying the resulting REFSENS value derived from the requirement in Table 7.3.2.3-2 with 4 Rx antenna ports tested.

7.3.2 Reference sensitivity power level

7.3.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward.

7.3.2.3 Minimum conformance requirements

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.2.3-1a, 7.3.2.3-1b, Table 7.3.2-1c, Table 7.3.2-1d and Table 7.3.2.3-2.

Table 7.3.2.3-1a: Two antenna port reference sensitivity QPSK $P_{REFSENS}$ for FDD bands

Operating band / SCS / Channel bandwidth											
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**35 MHz (dBm)**	**40 MHz (dBm)**	**45 MHz (dBm)**	**50 MHz (dBm)**
n1	15	-100.0	-96.8	-95.0	-93.8	-92.7	-91.9		-90.6	-90.1	-89.6
	30		-97.1	-95.1	-94.0	-92.8	-92.0		-90.7	-90.2	-89.7
	60		-97.5	-95.4	-94.2	-93.0	-92.1		-90.9	-90.3	-89.7
n2	15	-98	-94.8	-93	-91.8	-90.7	-84.1		-81.5		
	30		-95.1	-93.1	-92	-90.8	-84.2		-81.6		
	60		-95.5	-93.4	-92.2	-90.9	-84.3		-81.7		
n3	15	-97.0	-93.8	-92.0	-90.8	-89.7	-88.9	-86.2	-82.3	-81.3	-79.7
	30		-94.1	-92.1	-91.0	-89.8	-89.0	-86.3	-82.4	-81.4	-79.8
	60		-94.5	-92.4	-91.2	-90.0	-89.1	-86.4	-82.6	-81.5	-79.9
n5	15	-98.0	-94.8	-93.0	-86.8	-84.8					
	30		-95.1	-93.1	-88.6	-84.9					
n7[1]	15	-98.0	-94.8	-93.0	-91.8						
	30		-95.1	-93.1	-92.0						
	60		-95.5	-93.4	-92.2						
n8	15	-97.0	-93.8	-91.4	-85.8			-78.4			
	30		-94.1	-91.7	-87.2			-78.5			
n12	15	-97.0	-93.8	-84.0							
	30		-94.1	-84.1							
n14	15	-97.0	-93.8								
	30		-94.1								
n20	15	-97.0	-93.8	-91.0	-89.8						
	30		-94.1	-91.1	-90.0						
n24	15	-100.0	-96.8								
	30		-97.1								
	60		-97.5								
n25	15	-96.5	-93.3	-91.5	-90.3	-89.3	-82.2		-79.5		
	30		-93.6	-91.6	-90.5	-89.4	-82.3		-79.6		
	60		-94.0	-91.9	-90.7	-89.6	-82.4		-79.7		
n26	15	-97.5[6]	-94.5[6]	-92.7[6]	-87.6						
	30		-94.8[6]	-92.7[6]	-87.7						
n28	15	-98.5	-95.5	-93.5	-90.8		-78.5				
	30		-95.6	-93.6	-91.0		-78.6				
n30	15	-99.0	-95.8								
	30		-96.1								
n65	15	-99.5	-96.3	-94.5	-93.3						-89.2
	30		-96.6	-94.6	-93.5						-89.3
	60		-97.0	-94.9	-93.7						-89.4
n66	15	-99.5	-96.3	-94.5	-93.3	-92.2	-91.4		-90.1	-89.6	
	30		-96.6	-94.6	-93.5	-92.3	-91.5		-90.2	-89.7	
	60		-97.0	-94.9	-93.7	-92.5	-91.6		-90.4	-89.8	
n70	15	-100.0	-96.8	-95.0	-93.8	-92.7					
	30		-97.1	-95.1	-94.0	-92.8					
	60		-97.5	-95.4	-94.2	-93.0					
n71	15	-97.2	-94.0	-91.6	-86.0						
	30		-94.3	-91.9	-87.4						
n74	15	-99.5[3]	-96.3[3]	-94.5[3]	-89.3[3]						
	30		-96.6[3]	-94.6[3]	-89.5[3]						
	60		-97.0[3]	-94.9[3]	-89.6[3]						

NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4
NOTE 3: The requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9 - 1510.9 MHz.
NOTE 4: Void
NOTE 5: Void
NOTE 6: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.
NOTE 7: Void.

Table 7.3.2.3-1b: Two antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands

Operating band / SCS / Channel bandwidth / REFSENS				
Operating band	SCS kHz	Channel bandwidth (MHz)	REFSENS (dBm)[8]	Duplex Mode
n34	15	5, 10, 15	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n38[1]	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n39	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n40	15	5, 10, 15, 20, 25, 30, 40, 50	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n41[1]	15	10, 15, 20, 30, 40, 50	$-94.8 + 10\log_{10}(N_{RB}/50)$	TDD
	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.5 + 10\log_{10}(N_{RB}/11)$	
n48[1]	15	5, 10, 15, 20, 30, 40, 50[5]	$-99 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15, 20, 30, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 30, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.5 + 10\log_{10}(N_{RB}/11)$	
n50	15	5, 10, 15, 20, 30, 40, 50	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10, 15, 20, 30, 40, 50, 60, 80	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 30, 40, 50, 60, 80	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n51	15	5	-100	TDD
n53	15	5, 10	$-100 + 10\log_{10}(N_{RB}/25)$	TDD
	30	10	-97.1	
	60	10	-97.5	
n75[7]	15	5,10,15,20	$-100 + 10\log_{10}(N_{RB}/25)$	SDL
	30	10,15,20	$-97.1 + 10\log_{10}(N_{RB}/24)$	
	60	10,15,20	$-97.5 + 10\log_{10}(N_{RB}/11)$	
n76[7]	15	5	-100	SDL
n77[1,4]	15	10, 15, 20, 40, 50	$-95.3 + 10\log_{10}(N_{RB}/50)$	TDD
	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	$-95.6 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	$-96.0 + 10\log_{10}(N_{RB}/11)$	
en78[1]	15	10, 15, 20, 40, 50	$-95.8 + 10\log_{10}(N_{RB}/50)$	TDD
	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	$-96.1 + 10\log_{10}(N_{RB}/24)$	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	$-96.5 + 10\log_{10}(N_{RB}/11)$	
n79[1]	15	40, 50	$-89.6 + 10\log_{10}(N_{RB}/216)$	TDD
	30	40, 50, 60, 80, 100	$-89.7 + 10\log_{10}(N_{RB}/106)$	
	60	40, 50, 60, 80, 100	$-89.9 + 10\log_{10}(N_{RB}/51)$	

NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4.
NOTE 3: Void
NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.
NOTE 6: Void
NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.
NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. "N_{RB}" in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.

For power class 2 UEs, certain degradation of the reference sensitivity in Table 7.3.2.3-1a is allowed. The maximum amount of degradation is specified in Table 7.3.2.3-1c, and in Table 7.3.2.3-1d for a UE that indicates *txDiversity-r16* [26].

Table 7.3.2.3-1c Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE not supporting Tx Diversity

Operating Band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	30 MHz (dB)	35 MHz (dB)	40 MHz (dB)	45 MHz (dB)	50 MHz (dB)
n1	0	0	0	0	0	0	-	0	0	0
n3	0.5	0.5	0.5	0.5	0.6	0.8	1.1	1.5	2.3	2.8
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4										

Table 7.3.2.3-1d Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE supporting Tx Diversity

Operating Band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	30 MHz (dB)	35 MHz (dB)	40 MHz (dB)	45 MHz (dB)	50 MHz (dB)
n1	0	0	0	0	0	0	-	0	0	0
n3	1.4	1.5	1.5	1.5	1.6	1.7	2.8	[5]	[5.5]	[6.0]
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2G.4										

For UE(s) equipped with 4 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3.2.3-1a and in Table 7.3.2.3-1b shall be modified by the amount given in $\Delta R_{IB,4R}$ in Table 7.3.2.3-2 for the applicable operating bands.

Table 7.3.2.3-2: Four antenna port reference sensitivity allowance $\Delta R_{IB,4R}$

Operating band	$\Delta R_{IB,4R}$ (dB)
n8, n28, n71	-2.7[1]
n1, n2, n3, n30, n40, n7, n34, n38, n39, n41, n66, n70	-2.7
n48, n77, n78, n79	-2.2
NOTE 1: 4 Rx operation is targeted for FWA form factor	

The reference sensitivity (REFSENS) requirement specified in Table 7.3.2.3-1a, Table 7.3.2.3-1b, Table 7.3.2.3-1c, Table 7.3.2.3-1d and Table 7.3.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3.

Table 7.3.2.3-3: Uplink configuration for reference sensitivity

Operating band / SCS (kHz) / Channel bandwidth (MHz) / Duplex mode															
CS	5	10	15	20	25	30	35	40	45	50	60	70	80	90	10
15	25	50[1]	75[1]	100[1]	128[1]	128[1]		128[1]	128[1]	128[1]					
30		24	36[1]	50[1]	64[1]	64[1]		64[1]	64[1]	64[1]					
60		10[1]	18	24	30[1]	30[1]		30[1]	30[1]	30[1]					
15	25	50[1]	50[1]	50[1]	50[1]	48[1]		40[1]							
30	10[1]	24	24[1]	24[1]	24[1]	24[1]		20[1]							
60		10[1]	10[1]	10[1]	10[1]	10[1]		10[1]							
15	25	50[1]	50[1]	50[1]	50[1]	50[1]	50[1]	50[1]	50[1]	50[1]					
30		24	24[1]	24[1]	24[1]	24[1]	24[1]	24[1]	24[1]	24[1]					
60		10[1]	10[1]	10[1]	10[1]	10[1]	10[1]	10[1]	10[1]	10[1]					
15	25	25[1]	25[1]	25[1]	Note 5										
30		10[1]	10[1]	10[1]	Note 5										
15	25	50[1]	75[1]	75[1]											
30		24	36[1]	36[1]											
60		10[1]	18	18[1]											
15	25	25[1]	25[1]	25[1]			Note 5								
30		10[1]	10[1]	10[1]			Note 5								
15	20[1]	20[1]	20[1]												
30		10[1]	10[1]												
15	20[1]	20[1]													
30		10[1]													
15	25	20[1]	20[2]	20[2]											
30		10[1]	10[2]	10[2]											
15	25	50													
30		24													
60		10													
15	25	50[1]	50[1]	50[1]	50[1]	48[1]		40[1]							
30		24	24[1]	24[1]	24[1]	24[1]		20[1]							
60		10[1]	10[1]	10[1]	10[1]	10[1]		10[1]							
15	25	25[1]	25[1]	25[1]											
30		12[1]	12[1]	12[1]											
15	25	25[1]	25[1]	25[1]		25[1]									
30		10[1]	10[1]	10[1]		10[1]									
15	20[1]	20[1]													
30		10[1]													
15	25	50	75												
30		24	36												
60		10	18												
15	25	50	75	100	128	160		216							
30		24	36	50	64	75		100							
60		10	18	24	30	36		50							
15	25	50	75	100	128	160		216							
30		24	36	50	64	75		100							
60		10	18	24	30	36		50							
15	25	50	75	100	128	160		216		270					
30		24	36	50	64	75		100		128	162		216		
60		10	18	24	30	36		50		64	75		100		
15		50	75	100		160		216		270					
30		24	36	50		75		100		128	162	180	216f	243	27
60		10	18	24		36		50		64	75	90	100	120	13
15	25	50	75	100		160		216							
30		24	36	50		75		100							
60		10	18	24		36		50							
15	25	50	75	100		160		216		270					
30		24	36	50		75		100		128	162		Note 3		
60		10	18	24		36		50		64	75		Note 3		
15	25														
15	25	50													
30		24													
60		10													

	Operating band / SCS (kHz) / Channel bandwidth (MHz) / Duplex mode														
CS	5	10	15	20	25	30	35	40	45	50	60	70	80	90	10
15	25	50[1]	75[1]	100[1]											
30		24	36[1]	50[1]											
60		10[1]	18	24											
15	25	50[1]	75[1]	100[1]	128[1]	160		216							
30		24	36[1]	50[1]	64[1]	75[1]		100[1]							
60		10[1]	18	24	30[1]	36[1]		50[1]							
15	25	50[1]	75[1]	Note 3	Note 3										
30		24	36[1]	Note 3	Note 3										
60		10[1]	18	Note 3	Note 3										
15	25	25[1]	20[1]	20[1]											
30		12[1]	10[1]	10[1]											
15	25	25[1]	25[1]	25[1]											
30		10[1]	10[1]	10[1]											
60		5[1]	5[1]	5[1]											
15		50	75	100				216		270					
30		24	36	50				100		128	162	180	216	243	27
60		10	18	24				50		64	75	90	100	120	13
15		50	75	100				216		270					
30		24	36	50				100		128	162	180	216	243	27
60		10	18	24				50		64	75	90	100	120	13
15								216		270					
30								100		128	162		216		27
60								50		64	75		100		13

urce blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the c
.3.2-1).
d 20; for 15kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 11 and in the case of 20MHz channe
urce blocks shall be located at RB_{start} 16; for 30kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 6
channel bandwidth, the UL resource blocks shall be located at RB_{start} 8; for 60kHz SCS, in the case of 15MHz channel bandwidth, the UL resource bloc
at RB_{start} 3 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 4.
channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest duplex distance shall be used.

DL channel bandwidth, the UL configuration of the highest UL channel bandwidth specified in Table 5.3.6-1 and the default Tx-Rx frequency separatio
4.4-1 shall be used.

Unless given by Table 7.3.2.3-4, the minimum requirements specified in Tables 7.3.2.3-1a, Tables 7.3.2.3-1b, Tables 7.3.2.3-1c, Tables 7.3.2.3-1d shall be verified with the network signalling value NS_01 (Table 6.2.3.3-1) configured.

Table 7.3.2.3-4: Network signalling value for reference sensitivity

Operating band	Network Signalling value
n2	NS_03
n12	NS_06
n14	NS_06
n24	NS_56
n25	NS_03
n30	NS_21
n48	NS_27
n53	NS_45
n66	NS_03
n70	NS_03
n71	NS_35

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3.2.3-1 shall be increased by the amount given in $\Delta R_{IB,c}$ defined in subclause 7.3.3 for the applicable operating bands.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3.2.

7.3.2.4 Test description

7.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3 The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3.2.4.1-1: Test Configuration Table

Initial Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal, TL/VL, TL/VH, TH/VL, TH/VH		
Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1		Low range, Mid range, High range (NOTE 4)		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3)		
Test SCS as specified in Table 5.3.5-1		Lowest		
Test Parameters				
Test ID	**Downlink Configuration**		**Uplink Configuration**	
	Modulation	**RB allocation**	**Modulation**	**RB allocation**
1	CP-OFDM QPSK	Full RB (NOTE 1)	DFT-s-OFDM QPSK	REFSENS (NOTE 2)
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to Table 7.3.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band. NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. NOTE 5: In a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated.				

Table 7.3.2.4.1-2: Downlink Configuration of each RB allocation

Channel Bandwidth	SCS(kHz)	LCRBmax	Outer RB allocation / Normal RB allocation
5MHz	15	25	25@0
	30	11	11@0
	60	N/A	N/A
10MHz	15	52	52@0
	30	24	24@0
	60	11	11@0
15MHz	15	79	79@0
	30	38	38@0
	60	18	18@0
20MHz	15	106	106@0
	30	51	51@0
	60	24	24@0
25MHz	15	133	133@0
	30	65	65@0
	60	31	31@0
30MHz	15	160	160@0
	30	78	78@0
	60	38	38@0
35MHz	15	188	188@0
	30	92	92@0
	60	44	38@0
40MHz	15	216	216@0
	30	106	106@0
	60	51	51@0
45MHz	15	128	128@0
	30	64	64@0
	60	30	30@0
50MHz	15	270	270@0
	30	133	133@0
	60	65	65@0
60MHz	15	N/A	N/A
	30	162	162@0
	60	79	79@0
70MHz	15	N/A	N/A
	30	189	189@0
	60	93	93@0
80MHz	15	N/A	N/A
	30	217	217@0
	60	107	107@0
90MHz	15	N/A	N/A
	30	245	245@0
	60	121	121@0
100MHz	15	N/A	N/A

	30	273	273@0
	60	135	135@0
NOTE 1: Test Channel Bandwidths are checked separately for each NR band, the applicable channel bandwidths are specified in Table 5.3.5-1.			

Table 7.3.2.4.1-3: Uplink configuration for reference sensitivity, LCRB @ RBstart format

10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	35 MHz	40 MHz	45 MHz	50 MHz	60 MHz	70 MHz	80 MHz
50@2[1]	75@4[1]	100@6[1]	128@5[1]	128@32[1]		128@88[1]	128@114[1]	128@142[1]			
24@0	36@2[1]	50@1[1]	64@1[1]	64@14[1]		64@42[1]	64@55[1]	64@69[1]			
10@1[1]	18@0	24@0	30@1[1]	30@8[1]		30@21[1]	30@28[1]	30@35[1]			
50@2[1]	50@29[1]	50@56[1]	50@83[1]	48@112[1]		40@176[1]					
24@0	24@14[1]	24@27[1]	24@41[1]	24@54[1]		20@86[1]					
10@1[1]	10@8[1]	10@14[1]	10@21[1]	10@28[1]		10@41[1]					
50@2[1]	50@29[1]	50@56[1]	50@83[1]	50@110[1]	50@138[1]	50@166[1]	50@192[1]	50@220[1]			
24@0	24@14[1]	24@27[1]	24@41[1]	24@54[1]	24@68[1]	24@82[1]	24@95[1]	24@109[1]			
10@1[1]	10@8[1]	10@14[1]	10@21[1]	10@28[1]	10@34[1]	10@41[1]	10@48[1]	10@55[1]			
25@27[1]	25@54[1]	25@81[1]	Note 5								
10@14[1]	10@28[1]	10@41[1]	Note 5								
50@2[1]	75@4[1]	75@31[1]									
24@0	36@2[1]	36@15[1]									
10@1[1]	18@0	18@6[1]									
25@27[1]	25@54[1]	25@81[1]			Note 5						
10@14[1]	10@28[1]	10@41[1]			Note 5						
20@32[1]	20@59[1]										
10@14[1]	10@28[1]										
20@0[1]											
10@0[1]											
20@0[1]	20@11[2]	20@16[2]									
10@0[1]	10@6[2]	10@8[2]									
50@0											
24@0											
10@0											
50@0	50@29[1]	50@56[1]	50@83[1]	48@112[1]		40@176[1]					
24@0	24@14[1]	24@27[1]	24@41[1]	24@54[1]		20@86[1]					

	10@0	10@8[1]	10@14[1]	10@21[1]	10@28[1]		10@41[1]					
	25@27[1]	25@54[1]	25@81[1]									
	12@12[1]	12@26[1]	12@39[1]									
	25@27[1]	25@54[1]	25@81[1]		25@135[1]							
	10@14[1]	10@28[1]	10@41[1]		10@68[1]							
	20@32[1]											
	10@14[1]											
	50@0	75@0										
	24@0	36@0										
	10@0	18@0										
	50@0	75@0	100@0	128@0	160@0		216@0					
	24@0	36@0	50@0	64@0	75@0		100@0					
	10@0	18@0	24@0	30@0	36@0		50@0					
	50@0	75@0	100@0	128@0	160@0		216@0					
	24@0	36@0	50@0	64@0	75@0		100@0					
	10@0	18@0	24@0	30@0	36@0		50@0					
	50@0	75@0	100@0	128@0	160@0		216@0		270@0			
	24@0	36@0	50@0	64@0	75@0		100@0		128@0	162@0		216@0
	10@0	18@0	24@0	30@0	36@0		50@0		64@0	75@0		100@0
	50@0	75@0	100@0		160@0		216@0		270@0			
	24@0	36@0	50@0		75@0		100@0		128@0	162@0	180@0	216@0
	10@0	18@0	24@0		36@0		50@0		64@0	75@0	90@0	100@0
	50@0	75@0	100@0		160@0		216@0					
	24@0	36@0	50@0		75@0		100@0					
	10@0	18@0	24@0		36@0		50@0					
	50@0	75@0	100@0				216@0		270@0			
	24@0	36@0	50@0				100@0		128@0	162@0		NOTE 3
	10@0	18@0	24@0				50@0		64@0	75@0		NOTE 3

	50@0											
	24@0											
	10@0											
	50@2[1]	75@4[1]	100@6[1]									
	24@0	36@2[1]	50@1[1]									
	10@1[1]	18@0	24@0									
	50@2[1]	75@4[1]	100@6[1]	128@5[1]	160@0		216@0					
	24@0	36@2[1]	50@1[1]	64@1[1]	75@3[1]		100@6[1]					
	10@1[1]	18@0	24@0	30@1[1]	36@2[1]		50@1[1]					
	50@2[1]	75@4[1]	NOTE 3	NOTE 3								
	24@0	36@2[1]	NOTE 3	NOTE 3								
	10@1[1]	18@0	NOTE 3	NOTE 3								
	25@01	20@01	20@01									
	12@01	10@01	10@01									
	25@27[1]	25@54[1]	25@81[1]									
	10@14[1]	10@28[1]	10@41[1]									
	5@6[1]	5@13[1]	5@19[1]									
	50@0	75@0	100@0				216@0		270@0			
	24@0	36@0	50@0				100@0		128@0	162@0	180@0	216@0
	10@0	18@0	24@0				50@0		64@0	75@0	90@0	100@0
	50@0	75@0	100@0				216@0		270@0			
	24@0	36@0	50@0				100@0		128@0	162@0	180@0	216@0
	10@0	18@0	24@0				50@0		64@0	75@0	90@0	100@0
							216@0		270@0			
							100@0		128@0	162@0		216@0
							50@0		64@0	75@0		100@0

all be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1).
z SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16; for 30k
idth, the UL resource blocks shall be located at RBstart 6 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 8; for 60kHz SCS, in the case of 15MHz channel bandwi
start 3 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 4.
idths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest duplex distance shall be used.

ndwidth, the UL configuration of the highest UL channel bandwidth specified in Table 5.3.6-1 and the default Tx-Rx frequency separation specified in Table 5.4.4-1 shall be used.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The UL and Reference Measurement Channel is set according to Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3.2.4.3.

7.3.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.3.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.2.5-1 if 2Rx antennas connected or Table 7.3.2.5-2 if 4Rx antennas connected. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED for NR band.

Message contents are according to TS 38.508-1[5] subclause 4.6 with the following exceptions for each network signalling value.

7.3.2.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 38.508-1 [5] subclause 4.6 can be used without exceptions.

7.3.2.4.3.2 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.2-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_03" and NR band n2, n25 and n66

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	2 (NS_03)		

Table 7.3.2.4.3.2-2: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_03" and NR band n70

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_03)		

7.3.2.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.3-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_06" and NR band n12 and n14

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_06)		

7.3.2.4.3.4 Message contents exceptions (network signalled value "NS_35")

1. Information element additionalSpectrumEmission is set to NS_35. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.4-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_35" and NR band n71

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_35)		

7.3.2.4.3.5 Message contents exceptions (network signalled value "NS_27")

1. Information element additionalSpectrumEmission is set to NS_27. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.5-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_27" and NR band n48

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_27)		

7.3.2.4.3.6 Message contents exceptions (network signalled value "NS_21")

1. Information element additionalSpectrumEmission is set to NS_21. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.6-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_21" and NR band n30

Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_21)		

7.3.2.4.3.7 Message contents exceptions (network signalled value "NS_45")

1. Information element additionalSpectrumEmission is set to NS_45. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.7-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_45" and NR band n53

Derivation Path: TS 38.508-1 [5], Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_45)		

7.3.2.4.3.8 Message contents exceptions (network signalled value "NS_56")

1. Information element additionalSpectrumEmission is set to NS_56. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.8-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS_56" and NR band n24

Derivation Path: TS 38.508-1 [5], Table 4.6.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	1 (NS_56)		

7.3.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3.2.5-1a and Tables 7.3.2.5-1b for 2 Rx antenna port, Tables 7.3.2.5-2 a and Tables 7.3.2.5-2b for 4 Rx antenna port, Table 7.3.2.5-2c and Table 7.3.2.5-2d for PC2 UE on FDD bands, and parameters specified Tables 7.3.2.4.1-1, Tables 7.3.2.4.1-2 and Tables 7.3.2.4.1-3.

Table 7.3.2.5-1a: Two antenna port Reference sensitivity QPSK $P_{REFSENS}$ for FDD bands

Operating band / SCS / Channel bandwidth / Duplex-mode												
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**35 MHz (dBm)**	**40 MHz (dBm)**	**45 MHz (dBm)**	**50 MHz (dBm)**	**Duplex Mode**
n1	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT	-91.9 +TT		-90.6 +TT	-90.1 +TT	-89.6 +TT	FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT	-92.0 +TT		-90.7 +TT	-90.2 +TT	-89.7 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT	-92.1 +TT		-90.9 +TT	-90.3 +TT	-89.7 +TT	
n2	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT	-90.7 +TT	-84.1 +TT		-81.5 +TT			FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT	-90.8 +TT	-84.2 +TT		-81.6 +TT			
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT	-90.9 +TT	-84.3 +TT		-81.7 +TT			
n3	15	-97.0 +TT	-93.8 +TT	-92.0 +TT	-90.8 +TT	-89.7 +TT	-88.9 +TT	-86.2+TT	-87.6 +TT	-81.3+TT	-79.7 +TT	FDD
	30		-94.1 +TT	-92.1 +TT	-91.0 +TT	-89.8 +TT	-89.0 +TT	-86.3+TT	-87.7 +TT	-81.4+TT	-79.8 +TT	
	60		-94.5 +TT	-92.4 +TT	-91.2 +TT	-90.0 +TT	-89.1 +TT	-86.4+TT	-87.9 +TT	-81.5+TT	-79.9 +TT	
n5	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-86.8 +TT	-84.8 +TT						FDD
	30		-95.1 +TT	-93.1 +TT	-88.6 +TT	-84.9 +TT						
	60											
n7[1]	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT							FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT							
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT							
n8	15	-97.0 +TT	-93.8 +TT	-91.4 +TT	-85.8 +TT			-78.4+TT				FDD
	30		-94.1 +TT	-91.7 +TT	-87.2 +TT			-78.5+TT				
	60											
n12	15	-97.0 +TT	-93.8 +TT	-84.0 +TT								FDD
	30		-94.1 +TT	-84.1 +TT								
	60											
n14	15	-97.0 +TT	-93.8 +TT									FDD
	30		-94.1 +TT									

	60											
n20	15	-97.0 +TT	-93.8 +TT	-91.0 +TT	-89.8 +TT							FDD
	30		-94.1 +TT	-91.1 +TT	-90.0 +TT							
	60											
n24	15	-100.0 +TT	-96.8 +TT									FDD
	30		-97.1 +TT									
	60		-97.5 +TT									
n25	15	-96.5 +TT	-93.3 +TT	-91.5 +TT	-90.3 +TT	-89.3 +TT	-82.2 +TT		-79.5 +TT			FDD
	30		-93.6 +TT	-91.6 +TT	-90.5 +TT	-89.4 +TT	-82.3 +TT		-79.6 +TT			
	60		-94.0 +TT	-91.9 +TT	-90.7 +TT	-89.6 +TT	-82.4 +TT		-79.7 +TT			
n26	15	-97.5 +TT	-94.5 +TT	-92.7 +TT	-87.6 +TT							
	30		-94.8 +TT	-92.7 +TT	-87.7 +TT							
n28	15	-98.5 +TT	-95.5 +TT	-93.5 +TT	-90.8 +TT		-78.5 +TT					FDD
	30		-95.6 +TT	-93.6 +TT	-91.0 +TT		-78.6 +TT					
	60											
n30	15	-99.0 +TT	-95.8 +TT									FDD
	30		-96.1 +TT									
	60											
n65	15	-99.5+TT	-96.3+TT	-94.5+TT	-93.3+TT							FDD
	30		-96.6+TT	-94.6+TT	-93.5+TT							
	60		-97.0+TT	-94.9+TT	-93.7+TT							
n66	15	-99.5 +TT	-96.3 +TT	-94.5 +TT	-93.3 +TT	-92.2 +TT	-91.4 +TT		-90.1 +TT			FDD
	30		-96.6 +TT	-94.6 +TT	-93.5 +TT	-92.3 +TT	-91.5 +TT		-90.2 +TT			
	60		-97.0 +TT	-94.9 +TT	-93.7 +TT	-92.5 +TT	-91.6 +TT		-90.4 +TT			
n70	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT						FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT						
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT						
n71	15	-97.2 +TT	-94.0 +TT	-91.6 +TT	-86.0 +TT							FDD

	30		-94.3 +TT	-91.9 +TT	-87.4 +TT							
	60	-										
n74	15	-99.5[3] +TT	-96.3[3] +TT	-94.5[3] +TT	-93.3[3] +TT							FDD
	30		-96.6[3] +TT	-94.6[3] +TT	-93.5[3] +TT							
	60		-97.0[3] +TT	-94.9[3] +TT	-93.7[3] +TT							

NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.4
NOTE 3: [3] indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.
NOTE 4: Void
NOTE 5: Void
NOTE 6: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.

Table 7.3.2.5-1b: Two antenna port reference sensitivity QPSK $P_{REFSENS}$ for TDD, SDL and FDD with variable duplex operation bands

Operating band / SCS / Channel bandwidth / REFSENS				
Operating band	SCS kHz	Channel bandwidth (MHz)	REFSENS (dBm)[8]	Duplex Mode
n34	15	5, 10, 15	$-100 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15	$-97.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15	$-97.5 + 10\log_{10}(N_{RB}/11)+TT$	
n38[1]	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)+TT$	
n39	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)+TT$	
n40	15	5, 10, 15, 20, 25, 30, 40, 50	$-100 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.5 + 10\log_{10}(N_{RB}/11)+TT$	
n41[1]	15	10, 15, 20, 30, 40, 50	$-94.8 + 10\log_{10}(N_{RB}/50)+TT$	TDD
	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.5 + 10\log_{10}(N_{RB}/11)+TT$	
n48[1]	15	5, 10, 15, 20, 30, 40, 50[5]	$-99 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15, 20, 30, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.1 + 10\log_{10}(N_{RB}/24)+TT$	
	60	10, 15, 20, 30, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.5 + 10\log_{10}(N_{RB}/11)+TT$	
n50	15	5, 10, 15, 20, 30, 40, 50	$-100 + 10\log_{10}(N_{RB}/25)+TT$	TDD
	30	10, 15, 20, 30, 40, 50, 60, 80	$-97.1 + 10\log_{10}(N_{RB}/24)+TT$	

	60	10, 15, 20, 30, 40, 50, 60, 80	-97.5 + $10\log_{10}(N_{RB}/11)$+TT	
n51	15	5	-100+TT	TDD
n53	15	5, 10	-100 + $10\log_{10}(N_{RB}/25)$+TT	TDD
	30	10	-97.1+TT	
	60	10	-97.5+TT	
n77[1,4]	15	10, 15, 20, 40, 50	-95.3 + $10\log_{10}(N_{RB}/50)$+TT	TDD
	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-95.6 + $10\log_{10}(N_{RB}/24)$+TT	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.0 + $10\log_{10}(N_{RB}/11)$+TT	
n78[1]	15	10, 15, 20, 40, 50	-95.8 + $10\log_{10}(N_{RB}/50)$ +TT	TDD
	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.1 + $10\log_{10}(N_{RB}/24)$ +TT	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.5 + $10\log_{10}(N_{RB}/11)$+TT	
n79[1]	15	40, 50	-89.6 + $10\log_{10}(N_{RB}/216)$+TT	TDD
	30	40, 50, 60, 80, 100	-89.7 + $10\log_{10}(N_{RB}/106)$ +TT	
	60	40, 50, 60, 80, 100	-89.9 + $10\log_{10}(N_{RB}/51)$ +TT	

NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4.
NOTE 3: Void
NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.
NOTE 6: Void
NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.
NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. "N_{RB}" in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.
NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.

Table 7.3.2.5-2a: Four antenna port Reference sensitivity QPSK $P_{REFSENS}$ FDD bands

Operating Band	SCS kHz	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	35 MHz (dBm)	40 MHz (dBm)	45 MHz (dBm)	50 MHz (dBm)	Duplex Mode
n1	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT	-94.6 +TT		-93.3 +TT	-92.8 +TT	-92.3 +TT	FDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT	-94.7 +TT		-93.4 +TT	-92.9 +TT	-92.4 +TT	
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT	-94.8 +TT		-93.6 +TT	-93 +TT	-92.4 +TT	
n2	15	-100.7 +TT	-97.5 +TT	-95.7 +TT	-94.5 +TT	-93.4 +TT	-86.8 +TT		-84.2 +TT			FDD
	30		-97.8 +TT	-95.8 +TT	-94.7 +TT	-93.5 +TT	-86.9 +TT		-83.3 +TT			
	60		-98.2 +TT	-96.1 +TT	-94.9 +TT	-93.6 +TT	-87.0 +TT		-84.4 +TT			
n3	15	-99.7 +TT	-96.5 +TT	-94.7 +TT	-93.5 +TT	-92.4 +TT	-91.6 +TT	-88.9+TT	-90.3 +TT	-84.0+TT	-82.4 +TT	FDD
	30		-96.8 +TT	-94.8 +TT	-93.7 +TT	-92.5 +TT	-91.7 +TT	-90.0+TT	-90.4 +TT	-84.1+TT	-82.5 +TT	
	60		-97.2 +TT	-95.1 +TT	-93.9 +TT	-92.7 +TT	-91.8 +TT	-90.1+TT	-90.6 +TT	-84.2+TT	-82.6 +TT	
n7	15	-100.7 +TT	-97.5 +TT	-95.7 +TT	-94.5 +TT							FDD
	30		-97.8 +TT	-95.8 +TT	-94.7 +TT							
	60		-98.2 +TT	-97.1 +TT	-94.9 +TT							
n8	15	-99.7 +TT	-96.5 +TT	-94.1 +TT	-88.5 +TT							FDD
	30		-96.8 +TT	-94.4 +TT	-89.9 +TT							
	60											
n30	15	-101.7 +TT	-98.5 +TT									FDD
	30		-98.8 +TT									
	60											
n66	15	-102.2 +TT	-99.0 +TT	-97.2 +TT	-96.0 +TT	-94.9 +TT	-94.1 +TT		-92.8 +TT			FDD

	30		-99.3 +TT	-97.3 +TT	-96.2 +TT	-95.0 +TT	-94.2 +TT		-92.9 +TT			
	60		-99.7 +TT	-97.6 +TT	-96.4 +TT	-95.2 +TT	-94.3 +TT		-93.1 +TT			
n70	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT						FDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT						
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT						

NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE.
NOTE 2 The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 3: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.
NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.

Table 7.3.2.5-2b: Four antenna port Reference sensitivity QPSK $P_{REFSENS}$ for TDD, SDL and FDD with variable duplex operation bands

Operating band / SCS / Channel bandwidth / REFSENS				
Operating band	**SCS kHz**	**Channel bandwidth (MHz)**	**REFSENS (dBm)[8]**	**Duplex Mode**
n34	15	5, 10, 15	$-100 + 10\log_{10}(N_{RB}/25)$-2.7 +TT	TDD
	30	10, 15	$-97.1 + 10\log_{10}(N_{RB}/24)$+-2.7 TT	
	60	10, 15	$-97.5 + 10\log_{10}(N_{RB}/11)$-2.7 +TT	
n38[1]	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)$-2.7 +TT	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)$-2.7 +TT	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)$-2.7 +TT	
n39	15	5, 10, 15, 20, 25, 30, 40	$-100 + 10\log_{10}(N_{RB}/25)$-2.7 +TT	TDD
	30	10, 15, 20, 25, 30, 40	$-97.1 + 10\log_{10}(N_{RB}/24)$-2.7 +TT	
	60	10, 15, 20, 25, 30, 40	$-97.5 + 10\log_{10}(N_{RB}/11)$-2.7 +TT	
n40	15	5, 10, 15, 20, 25, 30, 40, 50	$-100 + 10\log_{10}(N_{RB}/25)$ - 2.7 +TT	TDD
	30	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.1 + 10\log_{10}(N_{RB}/24)$-2.7 +TT	
	60	10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	$-97.5 + 10\log_{10}(N_{RB}/11)$-2.7 +TT	
n41[1]	15	10, 15, 20, 30, 40, 50	$-94.8 + 10\log_{10}(N_{RB}/50)$-2.7 +TT	TDD
	30	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.1 + 10\log_{10}(N_{RB}/24)$-2.7 +TT	
	60	10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100	$-95.5 + 10\log_{10}(N_{RB}/11)$-2.7 +TT	
n48[1]	15	5, 10, 15, 20, 30, 40, 50[5]	$-99 + 10\log_{10}(N_{RB}/25)$-2.2 +TT	TDD
	30	10, 15, 20, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.1 + 10\log_{10}(N_{RB}/24)$-2.2 +TT	
	60	10, 15, 20, 40, 50[5], 60[5], 70[5], 80[5], 90[5], 100[5]	$-96.5 + 10\log_{10}(N_{RB}/11)$-2.2+TT	
n77[1,4]	15	10, 15, 20, 40, 50	$-95.3 + 10\log_{10}(N_{RB}/50)$-2.2 +TT	TDD

	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-95.6 + $10\log_{10}(N_{RB}/24)$-2.2 +TT	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.0 + $10\log_{10}(N_{RB}/11)$-2.2 +TT	
n78[1]	15	10, 15, 20, 40, 50	-95.8 + $10\log_{10}(N_{RB}/50)$-2.2 +TT	TDD
	30	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.1 + $10\log_{10}(N_{RB}/24)$-2.2 +TT	
	60	10, 15, 20, 40, 50, 60, 70, 80, 90, 100	-96.5 + $10\log_{10}(N_{RB}/11)$-2.2 +TT	
n79[1]	15	40, 50	-89.6 + $10\log_{10}(N_{RB}/216)$-2.2 +TT	TDD
	30	40, 50, 60, 80, 100	-89.7 + $10\log_{10}(N_{RB}/106)$-2.2 +TT	
	60	40, 50, 60, 80, 100	-89.9 + $10\log_{10}(N_{RB}/51)$-2.2 +TT	

NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4.
NOTE 3: Void
NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.
NOTE 6: Void
NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.
NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. "N_{RB}" in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.
NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.

Table 7.3.2.5-2c: Reference Sensitivity for PC2 UE on FDD bands for UE not supporting Tx Diversity

Operating Band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	30 MHz (dB)	35 MHz (dB)	40 MHz (dB)	45 MHz (dB)	50 MHz (dB)
n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	-	REFSENS_n1	REFSENS_n1	REFSENS_n1
n3	REFSENS_n3 +0.5	REFSENS_n3+ 0.5	REFSENS_n3+ 0.5	REFSENS_n3+ 0.5	REFSENS_n3+ 0.6	REFSENS_n3+ 0.8	REFSENS_n3+ 1.1	REFSENS_n3+ 1.5	REFSENS_n3+ 2.3	REFSENS_n3+ 2.8
NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4 NOTE 2: REFSENS_n1 refers to the two antenna port and four antenna port Reference Sensitivity of n1 in Table 7.3.2.5-1a and Table 7.3.2.5-2a. NOTE 3: REFSENS_n3 refers to the two antenna port and four antenna port Reference Sensitivity of n3 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.										

Table 7.3.2.5-2d: Reference Sensitivity for PC2 UE on FDD bands for UE supporting Tx Diversity operation bands

Operating Band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	30 MHz (dB)	35 MHz (dB)	40 MHz (dB)	45 MHz (dB)	50 MHz (dB)
n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	REFSENS_n1	-	REFSENS_n1	REFSENS_n1	REFSENS_n1
n3	REFSENS_n3+ 1.4	REFSENS_n3+ 1.5	REFSENS_n3+ 1.5	REFSENS_n3+ 1.5	REFSENS_n3+ 1.6	REFSENS_n3+ 1.7	REFSENS_n3+ 2.8	REFSENS_n3+ [5]	REFSENS_n3+ [5.5]	REFSENS_n3+ [6.0]
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2G.4 NOTE 2: REFSENS_n1 refers to the two antenna port and four antenna port Reference Sensitivity of n1 in Table 7.3.2.5-1a and Table 7.3.2.5-2a. NOTE 3: REFSENS_n3 refers to the two antenna port and four antenna port Reference Sensitivity of n3 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.										

Table 7.3.2.5-3: Test Tolerance (TT) for RX sensitivity level

f ≤ 3.0GHz	3.0GHz < f ≤ 6.0 GHz
0.7 dB	1.0 dB

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3.2.5-1 a and Table 7.3.2.5-1b shall be increased by the amount given in $\Delta R_{IB,c}$ defined in subclause 7.3.3 for the applicable operating bands.

7.3.3 ΔRIB,c

For a UE supporting CA, SUL or DC band combination, the minimum requirement for reference sensitivity in Table 7.3.2.3-1 shall be increased by the amount given by $\Delta R_{IB,c}$ defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the average value for all band combinations defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum $\Delta R_{IB,c}$ among the different supported band combinations involving such band shall be applied

- When the operating band frequency range is > 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the maximum value for all band combinations defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

7.3A Reference sensitivity for CA

Editor's Note: This clause is incomplete. The following aspects are either missing or not yet determined:

Test requirement table for 2DL/2UL is not complete.

- Reference sensitivity power level for 4DL_CA and 5DL_CA are FFS.

- Test description for exceptional cases are incomplete.

7.3A.0 Minimum conformance requirements

7.3A.0.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3A.0.2 Reference sensitivity power level for CA

7.3A.0.2.1 Reference sensitivity power level for Intra-band contiguous CA

For intra-band contiguous carrier aggregation, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.2.3-1, Table 7.3.2.3-2, and Table 7.3.2.3-3.

For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.2.3-3 and the downlink PCC carrier centre frequency shall be configured closer to uplink operating band than any of the downlink SCC centre frequency.

7.3A.0.2.2 Reference sensitivity power level for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) and parameters specified in Table 7.3.2.3-1, Table 7.3.2.3-2, and Table 7.3A.0.2.2-1 with the reference sensitivity power level increased by ΔR_{IBNC} given in Table 7.3A.0.2.2-1 for the SCC(s). For aggregation of two or more downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0.2.2-1. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.3.3.1-1) configured.

Table 7.3A.0.2.2-1: Intra-band non-contiguous CA with one uplink configuration for reference sensitivity

CA configuration	SCS (PCC/SCC) (kHz)	Aggregated channel bandwidth (PCC+SCC)	W_{gap} / [MHz]	UL PCC allocation	ΔR_{IBNC} (dB)	Duplex mode
CA_n66(2A)	N/A	NOTE 1	NOTE 2	NOTE 3, NOTE 4	0.0	FDD
CA_n71(2A)	15/15	5MHz + 5MHz	W_{gap} = 25.0	5	4.0	FDD
			W_{gap} = 5.0	20	0.0	
		10MHz + 5MHz	W_{gap} = 20.0	5 (RB_{start} = 9)	4.6	
			W_{gap} = 5.0	20 (RB_{start} = 9)	2.3	
		15MHz + 10MHz	W_{gap} = 10.0	5 (RB_{start} = 2)	22.2	
			W_{gap} = 5.0	20 (RB_{start} = 19)	5.2	
CA_n77(2A)		NOTE 1	NOTE 2	NOTE 3	0.0	TDD
CA_n78(2A)		NOTE 1	NOTE 2	NOTE 3	0.0	TDD

NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.2-1.
NOTE 2: All applicable sub-block gap sizes.
NOTE 3: The PCC allocation is same as Transmission bandwidth configuration N_{RB} as defined in Table 5.3.2-1.
NOTE 4: The carrier centre frequency of PCC in the DL operating band is configured closer to the UL operating band.
NOTE 5: W_{gap} is the sub-block gap between the two sub-blocks.

7.3A.0.2.3 Reference sensitivity power level for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 with parameters specified in Table 7.3.2.3-1, Table 7.3.2.3-2 and Table 7.3.2.3-3 modified in accordance with subclause 7.3A.0.3.2. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. Exceptions to reference sensitivity are allowed in accordance with subclause 7.3A.0.4.

7.3A.0.2.4 Reference sensitivity power level for SDL bands

For band combinations including operating bands without uplink band (as noted in Table 5.2-1), the requirements are specified in Table 7.3A.0.2.4-1 and for any band with uplink the uplink configuration specified in Table 7.3.2.3-3. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels, as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one-sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal, as described in Annex A.5.1.1/A.5.2.1). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. Exceptions to reference sensitivity are allowed in accordance with clause 7.3A.0.4.

Table 7.3A.0.2.4-1: Reference sensitivity for SDL bands

NR Band/Channel bandwidth															
NR CA Configuration	NR band	SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
			dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
CA_n8A-n75A	n8	15	-97.0	-93.8	-92.0	-90.0								
		30		-94.1	-92.1	-90.2								
		60												
	n75	15	-100	-96.8	-95.0	-93.8								
		30		-97.1	-95.1	-94.0								
		60		-97.5	-95.4	-94.2								
CA_n28A-n75A	n28	15	-98.5	-95.5	-93.5	-90.8								
		30		-95.6	-93.6	-91.0								
		60												
	n75	15	-100	-96.8	-95.0	-93.8								
		30		-97.1	-95.1	-94.0								
		60		-97.5	-95.4	-94.2								
CA_n29A-n66A CA_n29A-n66B CA_n29A-n66(2A)	n29	15	-97.0	-93.8										
		30		-94.1										
		60												
	n66	15	-99.5	-96.3	-94.5	-93.3			-90.1					
		30		-96.6	-94.6	-93.5			-90.2					
		60		-97.0	-94.9	-93.7			-90.4					
CA_n29A-n70A	n29	15	-97.0	-93.8										
		30		-94.1										
		60												
	n70	15	-100	-96.8	-95.0	-93.8	-92.7							
		30		-97.1	-95.1	-94.0	-92.8							
		60		-97.5	-95.4	-94.2	-93.0							
CA_n29A-n71A	n29	15	-97.0[3]	-93.8[3]										
		30		-94.1[3]										
		60												

	n71	15	-97.2	-94.0	-91.6	-86.0								
		30		-94.3	-91.9	-87.4								
		60												
CA_n75A-n78A[1]	n75	15	-100	-96.8	-95.0	-93.8								
		30		-97.1	-95.1	-94.0								
		60		-97.5	-95.4	-94.2								
	n78	15		-95.8	-94.0	-92.7			-89.6	-88.6				
		30		-96.1	-94.1	-92.9			-89.7	-88.7	-87.9	-86.6	-86.1	-85.6
		60		-96.5	-94.4	-93.1			-89.9	-88.8	-88.0	-86.7	-86.2	-85.7

			NR Band/Channel bandwidth											
NR CA Configuration	**NR band**	**SCS (kHz)**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**	**90 MHz**	**100 MHz**
CA_n76A-n78A[1]	n76	15	-100											
		30												
		60												
	n78	15		-95.8	-94.0	-92.7			-89.6	-88.6				
		30		-96.1	-94.1	-92.9			-89.7	-88.7	-87.9	-86.6	-86.1	-85.6
		60		-96.5	-94.4	-93.1			-89.9	-88.8	-88.0	-86.7	-86.2	-85.7

NOTE 1: The transmitter shall be set to P_{UMAX}, as defined in subclause 6.2.4.
NOTE 2: Four Rx antenna ports shall be the baseline for this operating band, except for two Rx vehicular UE.
NOTE 3: For CA_n29-n71 MSD due to cross band isolation exception specified in Table 7.3A.0.6-1 is applied

7.3A.0.3 $\Delta R_{IB,c}$ for CA

7.3A.0.3.1 General

For a UE supporting a CA configuration, the $\Delta R_{IB,c}$ applies for both SC and CA operation.

7.3A.0.3.2 $\Delta R_{IB,c}$ for Inter-band CA

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in subclause 7.3A.0 shall be increased by the amount given by $\Delta R_{IB,c}$ defined in subclause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the average value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum $\Delta R_{IB,c}$ among the different supported band combinations involving such band shall be applied.

- When the operating band frequency range is > 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the maximum value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14] for the applicable operating bands.

7.3A.0.3.2.1 $\Delta R_{IB,c}$ for two bands

Table 7.3A.0.3.2.1-1: $\Delta R_{IB,c}$ due to CA (two bands)

Inter-band CA configuration	NR Band	$\Delta R_{IB,c}$ (dB)
CA_n1-n77	n1	0.2
	n77	0.5
CA_n1-n78	n78	0.5
CA_n2-n48	n2	0.2
	n48	0.5
CA_n2-n66	n2	0.3
	n66	0.3
CA_n2-n77	n2	0.2
	n77	0.5
CA_n3-n41	n41	0[2]
		0.5[3]
CA_n3-n77	n3	0.2
	n77	0.5
CA_n3-n78	n3	0.2
	n78	0.5
CA_n3-n79	n79	0.5
CA_n5-n77	n5	0.2
	n77	0.5
CA_n5-n78	n5	0.2
	n78	0.5
CA_n7-n78	n7	0.5
	n78	0.5
CA_n8-n78	n8	0.2
	n78	0.5
CA_n8-n79	n79	0.5
CA_n24-n48	n24	0.2
	n48	0.5
CA_n24-n77	n24	0.2
	n77	0.5
CA n28-n75	n28	0.2
CA_n28-n78	n28	0.2
	n78	0.5
CA_n28-n79	n28	0.2
	n79	0.5
CA_n41-n78[1]	n78	0.5
CA_n41-n79	n41	0.5
	n79	0.5
CA_n48-n66	n48	0.5
	n66	0.2
CA_n48-n70	n48	0.5
	n70	0.2
CA_n75-n78	n78	0.5
CA_n76-n78	n78	0.5
NOTE 1: The requirements only apply when the sub-frame and Tx-Rx timings are synchronized between the component carriers. In the absence of synchronization, the requirements are not within scope of these specifications. NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690 MHz. NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.		

7.3A.0.3.2.2 Void

7.3A.0.3.2.3 $\Delta R_{IB,c}$ for three bands

Table 7.3A.0.3.2.3-1: $\Delta R_{IB,c}$ due to CA (three bands)

Inter-band CA combination	NR Band	$\Delta R_{IB,c}$ (dB)
CA_n1-n78-n79	n78	0.5
CA_n26-n66-n70	n26	0
	n66	0
	n70	0
CA_n26-n70-n71	n26	0
	n70	0
	n71	0
CA_n48-n66-n70	n48	0.5
	n66	0.2
	n70	0.2
CA_n48-n66-n71	n48	0.2
	n70	0.2
	n71	0.2
CA_n48-n70-n71	n48	0.2
	n70	0.2
	n71	0.2
CA_n66-n70-n71	n66	0
	n70	0
	n71	0

7.3A.0.3.2.4 $\Delta R_{IB,c}$ for four bands

Table 7.3A.0.3.2.4-1: $\Delta R_{IB,c}$ due to CA (four bands)

Inter-band CA combination	NR Band	$\Delta R_{IB,c}$ (dB)

7.3A.0.4 Reference sensitivity exceptions due to UL harmonic interference for CA

Editor's Note: Table 7.3A.0.4-1 format is different from 38.101-1 (V17.6.0) Table 7.3A.4-1. The old format will exist until RAN5 has final solutions on how to adopt RAN4 corresponding table for the minimum requirement of Reference sensitivity exceptions due to UL harmonic, and the resulted possible new format of Table 7.3A.1_1.4.1-1: Test Configuration Table for inter-band 2DL CA exceptions, and Table 7.3A.1_1.5-1: Reference sensitivity requirement for inter band CA.

Sensitivity degradation is allowed for a band in frequency range 1 if it is impacted by UL harmonic interference from another band in frequency range 1 of the same CA configuration. Reference sensitivity exceptions are specified in Table 7.3A.0.4-1 with uplink configuration specified in Table 7.3A.0.4-2.

Table 7.3A.0.4-1: Reference sensitivity exceptions due to UL harmonic for NR CA FR1

	MSD due to harmonic exception for the DL band													
UL band	DL band	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHZ	80 MHz	90 MHz	100 MHz
		dB	dB	dB	dB	dB	dB	dB	dB	dB		dB	dB	dB

n1	n77[1,2]		23.9	22.1	20.9			17.9	16.8	16.0		14.8	14.3	13.8
	n77[3]		1.1	0.8	0.3									
n3	n77[1,2]		23.9	22.1	20.9			17.9	16.9	16.1		14.8	14.3	13.8
	n77[3]		1.1	0.8	0.3									
n3	n78[1,2]		23.9	22.1	20.9			17.9	16.9	16.1		14.8	14.3	13.8
	n78[3]		1.1	0.8	0.3									
n5	n77[4,5,13]		10.5	8.9	7.8	7.2	6.5	5.1	4.2	3.5	2.8	2.3	2.1	1.4
n5	n77[6,7,13]		10.4	8.9	7.8	6.7	6.0	4.7	3.7	3	2.3	1.7	1.2	0.7
n5	n78[4,5]		10.5	8.9	7.8	7.1	6.5	5.4	4.2	3.5		2.3	2.1	1.4
n8	n78[4,5]		10.8	9.1	8.0			5.1	4.2	3.5		2.3	2.1	1.4
n8	n79[6,7]							[6.8]	6.2	[5.6]		4.9		4.4
n24	n77[1,2,13]		23.9	22.1	20.9	19.8	19.0	17.9	16.8	16.0		14.8	14.3	13.8
	n77[3,13]		1.1	0.8	0.3	0.1								
n28	n75[1,2]	28.1	25.3	24.0	22.8									
	n78[6,7]		[10.4]	[8.9]	[7.8]			[4.7]	[3.7]	[3]		[1.7]	[1.2]	[0.7]
n66	n48[1,2]	27.1	23.9	22.1	20.9			17.9	16.9[12]	16.1[12]			14.8[12]	14.3[12]
	n48[3]	1.9	1.1	0.8	0.3									
n71	n70[8,9]	9.9	7.1	6.7	4.9	4.1								

NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ΔF_{HD} above and below the edge of this downlink transmission bandwidth. The value ΔF_{HD} depends on the band combination: ΔF_{HD} = 10 MHz for CA_n1-n77, CA_n3-n77, CA_n3-n78.

NOTE 2: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 3: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at $\pm\left(20 + BW_{Channel}^{HB} / 2\right)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 4: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 5: The requirements should be verified for UL NR-ARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \left\lfloor f_{DL}^{HB} / 0.4 \right\rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 6: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 5th transmitter harmonic is within the downlink transmission bandwidth of a high band.

NOTE 7: The requirements should be verified for UL NR-ARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.5 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} the carrier frequency of a high band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the low band.

NOTE 8: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.

NOTE 9: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.3 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 10: These requirements apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band n25 is located with its upper edge at 1995 MHz.

NOTE 11: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.2 apply unless otherwise specified).

NOTE 12: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.

NOTE 13: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped.

Table 7.3A.0.4-1a: Reference sensitivity exceptions and uplink/downlink configurations due to UL harmonic from a PC3 aggressor NR UL band for NR DL CA FR1

UL band	DL band	UL BW	SCS of UL band	UL RB Allocation	DL BW	MSD	UL/DL fc condition	UL/DL harmonic order
		(MHz)	(kHz)	L_{CRB}	(MHz)	(dB)		
n2	n48	5	15	25 (RBstart=0)	5	27.1	NOTE 2	UL2/DL1 direct-hit
n2	n48	10	15	50 (RBstart=0)	100[7]	13.8	NOTE 2	UL2/DL1 direct-hit
n2	n48	5	15	25 (RBstart=0)	10	1.9	NOTE 6	UL2/DL1 near-miss
n2	n77	5	15	25 (RBstart=0)	10	23.9	NOTE 2	UL2/DL1 direct-hit
n2	n77	10	15	50 (RBstart=0)	100	13.8	NOTE 2	UL2/DL1 direct-hit
n2	n77	5	15	25 (RBstart=0)	10	1.1	NOTE 6	UL2/DL1 near-miss

NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd / 3rd / 4th / 5th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.

NOTE 2: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB}/0.2 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$ with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.

NOTE 3: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB}/0.3 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$ with the carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the low band.

NOTE 4: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB}/0.4 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB}/0.5 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 6: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at $\pm(20 + BW_{Channel}^{HB}/2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

Table 7.3A.0.4-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for NR CA, FR1

	NR Band / Channel bandwidth of the high band													
UL band	**DL band**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**70 MHz**	**80 MHz**	**90 MHz**	**100 MHz**
n1	n77		25	36	50			100	100	100		100	100	100
n3	n77		25	36	50			50	50	50		50	50	50
n3	n78		25	36	50			50	50	50		50	50	50
n5	n77		16	25	25	25	25	25	25	25	25	25	25	25
n5	n78		16	25	25	25	25	25	25	25		25	25	25
n8	n78		16	25	25			25	25	25		25	25	25
n8	n79							25	25	25		25		25
n24	n77	12	25	25	25	25	25	25	25	25		25	25	25
n28	n75	12	25	36	50									
n28	n78		10	15	20			25	25	25		25	25	25
n66	n48	12	25	36	50			100	128	160			200	200
n71	n70	8	16	20	20	20								
	NOTE 1: 15kHz SCS is assumed for UL band. NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.2.3-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2.3-3 applies. NOTE 3: Unless stated otherwise, UL resource blocks shall be centred within the transmission bandwidth configuration for the channel bandwidth.													

Table 7.3A.0.4-3: Void

Table 7.3A.0.4-3a: Void

Sensitivity degradation is allowed for a band if it is impacted by receiver harmonic mixing due to another band part of the same CA configuration. Reference sensitivity exceptions are specified in Table 7.3A.0.4-4 with uplink configuration specified in Table 7.3A.0.4-4a.

Table 7.3A.0.4-4: Reference sensitivity exceptions due to harmonic mixing from a PC3 aggressor NR UL band for DL NR CA FR1

UL band	DL band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	40 MHz (dB)	50 MHz (dB)	60 MHz (dB)	80 MHz (dB)	90 MHz (dB)	100 MHz (dB)
n41	n78[1]		8.3	8.0	6.9		3.9	3	2.3	1.2		0.4
n77	n2	6.7	5.0	4.0	3.7							
n77	n5	5.7	4.0	3.0	2.7							
n78	n41[2]		10.4	10.4	10.4		7.2	6.2	5.5	4.5		4.5
NOTE 1: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.15 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB}/2 \leq f_{UL}^{LB} \leq F_{UL\_high}^{LB} - BW_{Channel}^{LB}/2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band. NOTE 2: The requirements should be verified for UL EARFCN of the aggressor (high) band (superscript HB) such that $f_{UL}^{LB} = \lfloor 15 * f_{DL}^{HB} \rfloor 0.1$ in MHz and $F_{UL\_low}^{HB} + BW_{Channel}^{HB}/2 \leq f_{UL}^{HB} \leq f_{UL\_high}^{HB} - BW_{Channel}^{HB}/2$ with f_{DL}^{LB} carrier frequency in the victim (lower) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the higher band.												

Table 7.3A.0.4-4a: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for CA in NR FR1

UL band	DL band	SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
n41	n78	30		24	24	24		24	24	24	24	24	24
n77	n2	15	25	50	75	100							
n77	n5	15	25	20	20								
n78	n41	30		50	50	50		50	50	50	50	50	50
NOTE 1: The UL configuration applies regardless of the channel bandwidth of the UL band unless the UL resource blocks exceed that specified in Table 7.3.2.3-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2.3-3 applies.													

7.3A.0.5 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

For inter-band carrier aggregation with uplink assigned to two NR bands given in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a, the reference sensitivity is defined only for the specific uplink and downlink test points specified in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a. For these test points the reference sensitivity requirement specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 are relaxed by the amount of the corresponding parameter MSD given in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a.

Table 7.3A.0.5-1: 2DL/2UL interband Reference sensitivity QPSK $P_{REFSENS}$ and uplink/downlink configurations for PC3 CA

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA Configuration	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n1A-n3A	n1	1950	5	25	2140	23	FDD	IMD3
	n3	1760	5	25	1855	N/A	FDD	N/A
CA_n1-n8	n1	1965	5	25	2155	6.0	FDD	IMD4
	n8	887.5	5	25	932.5	N/A	FDD	N/A
CA_n1A-n78A	n1	1950	5	25	2140	8.0 10.7[5]	FDD	IMD4
	n78	3710	10	50	3710	N/A	TDD	N/A
CA_n2-n48	n2	1852.5	5	25	1932.5	12	FDD	IMD4
	n48	3625	20	100	3625	N/A	TDD	N/A
CA_n2-n66	n2	1855	5	25	1935	20	FDD	IMD3
	n66	1775	5	25	2175	N/A	FDD	N/A
	n2	1883.3	5	25	1963.3	N/A	FDD	N/A
	n66	1750	5	25	2150	4	FDD	IMD5
CA_n2-n77	n2	1855	5	25	1935	26 28.7[5]	FDD	IMD2
	n77	3790	10	50	3790	N/A	TDD	N/A
	n2	1900	5	25	1980	8.0 10.7[5]	FDD	IMD4
	n77	3720	10	50	3720	N/A	TDD	N/A
	n2	1885	5	25	1965	5	FDD	IMD5
	n77	3810	10	50	3810	N/A	TDD	N/A
	n2	N/A	5	N/A	1987.5	2.7	FDD	IMD7
	n77[12]	3455	10	1 RB_{START}=10	3455	N/A	TDD	N/A
		3945	10	1 1 RB_{START}=0	3945			
CA_n3A-n5A	n3	1771	10	50	1866	4	FDD	IMD4
	n5	838	5	25	883	N/A	FDD	N/A
CA_n3A-n41A	n3	1740	5	25	1835	8.2	FDD	IMD4
	n41	2657.5	10	50	2657.5	N/A	TDD	N/A
CA_n3A-n5A	n3	1721	10	50	1816	N/A	FDD	N/A
	n5	838	5	25	883	24	FDD	IMD2[3]
CA_n3A-n78A	n3	1740	5	25	1835	[26] [28.7[5]]	FDD	IMD2[4]
	n78	3575	10	25	3575	N/A	TDD	N/A
CA_n3A-n78A	n3	1765	5	25	1860	[8.0] [10.7[5]]	FDD	IMD4[4]
	n78	3435	10	25	3435	N/A	TDD	N/A
CA_n5-n66	n5	838	5	25	883	30	FDD	IMD24
	n66	1721	5	25	2121	N/A	FDD	N/A
CA_n5A-n77A[6]	n5	844	5	25	889	8.3	FDD	IMD4
	n77	3421	10	50	3421	N/A	TDD	N/A
	n5	829	5	25	874	5.5	FDD	IMD5
	n77	4190	10	50	4190	N/A	TDD	N/A
CA_n8A-n78A	n8	897.5	5	25	942.5	8.3	FDD	IMD4
	n78	3635	10	50	3635	N/A	TDD	N/A
CA_n24-n77[10]	n24	N/A	N/A	N/A	N/A	N/A	FDD	IMD4
	n77	N/A	N/A	N/A	N/A	N/A	TDD	N/A
CA_n26A-n66A	n26	838	5	25	883	30	FDD	IMD2[4]
	n66	1721	5	25	2121	N/A	FDD	N/A
CA_n26A-n70A	n26	838	5	25	883	30	FDD	IMD2[4]
	n70	1710	5	25	2020	N/A	FDD	N/A
CA_n48A-n66A	n48	3660	5	25	3660	N/A	TDD	N/A
	n66	1730	5	25	2130	5.0	FDD	IMD5
CA_n48A-n70A	n70	1697.5	25/15	25	1997.5	26 28.7[5]	FDD	IMD2[4]
	n48	3695	10	50	3695	N/A	TDD	N/A
	n66	1750	5	25	2150	5	FDD	IMD4

CA_n66A-n71A CA_n66(2A)-n71A CA_n66B-n71A	n71	675	5	25	629	N/A	FDD	N/A
CA_n66A-n77A	n66	1775	5	25	2175	31	FDD	IMD2
	n77	3950	10	50	3950	N/A	TDD	N/A
	n66	1760	5	25	2160	5.0	FDD	IMD5
	n77	3720	10	50	3720	N/A	TDD	N/A
CA_n70A-n71A	n70	1697.5	5	25	1997.5	5	FDD	IMD4
	n71	695.5	5	25	649.5	N/A	FDD	N/A

NOTE 1: Both of the transmitters shall be set min(+20 dBm, $P_{CMAX\_L,f,c}$) as defined in subclause 6.2A.4
NOTE 2: RB_{START} = 0, 15kHz SCS is assumed.
NOTE 3: No requirements apply when there is at least one individual RE within the intermodulation generated by the dual uplink is within the downlink transmission bandwidth of the FDD band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3 apply).
NOTE 4: This band is subject to IMD5 also which MSD is not specified.
NOTE 5: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
NOTE 6: TBD
NOTE 7: TBD
NOTE 8: TBD
NOTE 9: TBD
NOTE 10: There is no IMD4 product in band n24 downlink for n77 operating in 3450 – 3980 MHz and n24 uplink restricted to between 1627.5 – 1637.5 MHz and between 1646.5 – 1656.5 MHz.

Table 7.3A.0.5-1a: 2DL/2UL interband Reference sensitivity QPSK $P_{REFSENS}$ and uplink/downlink configurations for PC2 CA

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA Configuration	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n1-n78	n1	1950	5	25	2140	[17.8]	FDD	IMD4
	n78	3710	10	50	3710	N/A	TDD	N/A

NOTE 1: Both of the transmitters shall be set min(+23 dBm, $P_{CMAX\_L,f,c}$) as defined in clause 6.2A.4
NOTE 2: RB_{START} = 0, 15 kHz SCS is assumed.
NOTE 3: No requirements apply when there is at least one individual RE within the intermodulation generated by the dual uplink is within the downlink transmission bandwidth of the FDD band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3 apply).

Table 7.3A.0.5-2: 3DL/2UL interband Reference sensitivity QPSK $P_{REFSENS}$ and uplink/downlink configurations

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n1-n3-n28	n1	1975	5	25	2165	N/A	FDD	N/A
	n28	710.5	5	25	765.5	N/A	FDD	N/A
	n3	1723.5	5	25	1818.5	4.0	FDD	IMD5
	n3	1780	5	25	1875	N/A	FDD	N/A
	n28	710.5	5	25	765.5	N/A	FDD	N/A
	n1	1949	5	25	2139	11.0	FDD	IMD4
CA_n1-n3-n41	n1	1977.5	5	25	2167.5	N/A	FDD	N/A
	n3	1712.5	5	25	1807.5	N/A	FDD	N/A
	n41	2507.5	10	25	2507.5	5.0	TDD	IMD5
CA_n1-n3-n78	n1	1950	5	25	2140	N/A	FDD	N/A
	n3	1750	5	25	1845	N/A		N/A
	n78	3700	10	52	3700	28.4	TDD	IMD2
	n1	1950	5	25	2140	N/A	FDD	N/A
	n3	1770	5	25	1865	N/A		N/A
	n78	3360	10	52	3360	11.2	TDD	IMD4
	n1	1950	5	25	2140	N/A	FDD	N/A
	n3	1735	5	25	1830	27.9		IMD2
	n78	3780	10	52	3780	N/A	TDD	N/A
CA_n1-n5-n7	n1	1968	5	25	2158	N/A	FDD	N/A
	n7	2512	10	50	2632	N/A	FDD	N/A
	n5	835	5	25	880	1.0	FDD	IMD5
CA_n1-n5-n78	n1	1932	5	25	2122	18.1	FDD	IMD3
	n5	829	5	25	874	N/A	FDD	N/A
	n78	3780	10	50	3780	N/A	TDD	N/A
	n1	1975	5	25	2165	N/A	FDD	N/A
	n5	840	5	25	885	3.1	FDD	IMD5
	n78	3405	10	50	3405	N/A	TDD	N/A
	n1	1950	5	25	2140	N/A	FDD	N/A
	n5	830	5	25	875	N/A	FDD	N/A
	n78	3610	10	50	3610	15.7	TDD	IMD3
CA_n1-n7-n28	n1	1935	5	25	2125	N/A	FDD	N/A
	n7	2533	10	50	2653	30.0	FDD	IMD2
	n28	718	5	25	773	N/A	FDD	N/A
	n1	1935	5	25	2125	N/A	FDD	N/A
	n7	2510	10	50	2630	N/A	FDD	N/A
	n28	730	10	50	785	4.5	FDD	IMD5
CA_n1-n7-n78	n1	1977.5	5	25	2167.5	N/A	FDD	N/A
	n7	2507.5	5	25	2627.5	9.1	FDD	IMD4
	n78	3305	10	50	3305	N/A	TDD	N/A
	n1	1950	5	25	2140	8.7	FDD	IMD4
	n7	2510	10	50	2630	N/A	FDD	N/A
	n78	3580	10	50	3580	N/A	TDD	N/A
	n1	1970	5	25	2160	N/A	FDD	N/A
	n7	2520	5	25	2640	N/A	FDD	N/A
	n78	3390	10	50	3390	10.1	TDD	IMD4
CA_n1-n28-n78	n1	1960	5	25	2150	15.7	FDD	IMD3
	n28	740	5	25	795	N/A	FDD	N/A
	n78	3630	10	50	3630	N/A	TDD	N/A
	n1	1970	5	25	2160	N/A	FDD	N/A
	n28	739	5	25	794	4.2	FDD	IMD5
	n78	3352	10	50	3352	N/A	TDD	N/A
	n1	1950	5	25	2140	N/A	FDD	N/A
	n28	733	5	25	788	N/A	FDD	N/A
	n78	3416	10	50	3416	15.7	TDD	IMD3
CA_n1-n77-n79	n1	1950	5	25	2140	6.0	FDD	IMD3[1,2]
	n77	3400	10	50	3400	N/A	TDD	N/A
	n79	4660	40	216	4660	N/A	TDD	N/A

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n1-n78-n79	n1	1950	5	25	2140	N/A	FDD	N/A
	n78	3410	10	50	3410	N/A	TDD	N/A
	n79	4870	40	216	4870	15.9	TDD	IMD3[1,3]
	n1	1950	5	25	2140	N/A	FDD	N/A
	n78	3490	10	50	3490	4.6	TDD	IMD5[3]
	n79	4670	40	216	4670	N/A	TDD	N/A
	n1	1950	5	25	2140	15.6	FDD	IMD3[1,2]
	n78	3400	10	50	3400	N/A	TDD	N/A
	n79	4660	40	216	4660	N/A	TDD	N/A
CA_n2-n5-n30	n2	1870	5	25	1959	N/A	FDD	N/A
	n5	835	5	25	880	9.7	FDD	IMD4
	n30	2310	10	50	2355	N/A	FDD	N/A
CA_n2-n5-n66	n2	1900	5	25	1980	N/A	FDD	N/A
	n5	830	5	25	875	N/A	FDD	N/A
	n66	1740	5	25	2140	7.2	FDD	IMD4
CA_n2-n5-n77	n2	1907.5	5	25	1987.5	N/A	FDD	N/A
	n5	842.5	5	25	887.5	3.8	FDD	IMD5
	n77	3305	5	25	3305	N/A	TDD	N/A
	n2	1907	5	25	1987	16.5	FDD	IMD3
	n5	846.5	5	25	891.5	N/A	FDD	N/A
	n77	3680	5	25	3680	N/A	TDD	N/A
	n2	1880	5	25	1960	N/A	FDD	N/A
	n5	830	5	25	875	N/A	FDD	N/A
	n77	3540	10	50	3540	16.0	TDD	IMD3[1]
CA_n2-n12-n77	n2	1880	5	25	1960	16.5	FDD	IMD3[2]
	n12	707.5	5	25	737.5	N/A	FDD	N/A
	n77	3375	10	50	3375	N/A	TDD	N/A
	n2	1900	5	25	1980	N/A	FDD	N/A
	n12	707.5	5	25	737.5	N/A	FDD	N/A
	n77	3315	10	50	3315	16.0	TDD	IMD3[1,2]
CA_n2-n14-n66	n2	1874	5	25	1954	N/A	FDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n66	1762	5	25	2162	7.6	FDD	IMD4
	n2	1874	5	25	1954	7.2	FDD	IMD4
	n14	793	5	25	763	N/A	FDD	N/A
	n66	1770	5	25	2170	N/A	FDD	N/A
CA_n2-n14-n77	n2	1880	5	25	1960	16.5	FDD	IMD3
	n14	793	5	25	763	N/A	FDD	N/A
	n77	3546	10	50	3546	N/A	TDD	N/A
	n2	1880	5	25	1960	N/A	FDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n77	3466	10	50	3466	16.0	TDD	IMD3[1]
CA_n2-n30-n77	n2	1906	5	25	1986	8.6	FDD	IMD4
	n30	2312	5	25	2357	N/A	FDD	N/A
	n77	3305	10	50	3305	N/A	TDD	N/A
	n2	1905	5	25	1985	N/A	FDD	N/A
	n30	2309	5	25	2354	10.6	FDD	IMD4[1]
	n77	3361	10	50	3361	N/A	TDD	N/A
	n2	1870	5	25	1950	N/A	FDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	4180	10	50	4180	29.4	TDD	IMD2[2]

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n2-n66-n77	n2	1880	5	25	1960	N/A	FDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3620	10	50	3620	29.4	TDD	IMD2
	n2	1880	5	25	1960	N/A	FDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3340	10	50	3340	8.9	TDD	IMD4
	n2	1860	5	25	1940	N/A	FDD	N/A
	n66	1750	5	25	2150	31.2	FDD	IMD2
	n77	4010	10	50	4010	N/A	TDD	N/A
	n2	1880	5	25	1960	N/A	FDD	N/A
	n66	1760	5	25	2160	10.3	FDD	IMD4
	n77	3480	10	50	3480	N/A	TDD	N/A
	n2	1860	5	25	1940	N/A	FDD	N/A
	n66	1740	5	25	2140	2.8	FDD	IMD5
	n77	3860	10	50	3860	N/A	TDD	N/A
	n2	1880	5	25	1960	32.1	FDD	IMD2
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3700	10	50	3700	N/A	TDD	N/A
	n2	1880	5	25	1960	9.1	FDD	IMD4
	n66	1770	5	25	2170	N/A	FDD	N/A
	n77	3350	10	50	3350	N/A	TDD	N/A
	n2	1880	5	25	1960	2.1	FDD	IMD5
	n66	1760	5	25	2160	N/A	FDD	N/A
	n77	3620	10	50	3620	N/A	TDD	N/A
CA_n3-n5-n7	n3	1780	5	25	1875	N/A	FDD	N/A
	n5	845	5	25	890	N/A	FDD	N/A
	n7	2505	10	50	2625	30.0	FDD	IMD2[4]
	n3	1720	5	25	1815	N/A	FDD	N/A
	n5	835	5	25	880	19.0	FDD	IMD3
	n7	2560	10	50	2680	N/A	FDD	N/A
CA_n3-n5-n78	n3	1730	5	25	1825	N/A	FDD	N/A
	n5	839	5	25	884	N/A	FDD	N/A
	n78	3408	10	50	3408	16.1	TDD	IMD3
	n3	1730	5	25	1825	N/A	FDD	N/A
	n5	839	5	25	884	N/A	FDD	N/A
	n78	3512	10	50	3512	4.5	TDD	IMD5
	n3	1767	5	25	1862	15.7	FDD	IMD3
	n5	839	5	25	884	N/A	FDD	N/A
	n78	3540	10	50	3540	N/A	TDD	N/A
CA_n3-n7-n28	n3	1747	5	25	1842	N/A	FDD	N/A
	n7	2543	5	25	2663	N/A	FDD	N/A
	n28	741	5	25	796	20.0	FDD	IMD2
	n3	1712.5	5	25	1807.5	N/A	FDD	N/A
	n7	2562	5	25	2682	17.0	FDD	IMD3
	n28	743	5	25	798	N/A	FDD	N/A
	n3	1737.5	5	25	1832.5	16.5	FDD	IMD2
	n7	2543	5	25	2663	N/A	FDD	N/A
	n28	710.5	5	25	765.5	N/A	FDD	N/A
CA_n3-n7-n78	n3	1725	5	25	1820	17.6	FDD	IMD3
	n7	2565	5	25	2685	N/A	FDD	N/A
	n78	3310	10	50	3310	N/A	TDD	N/A
	n3	1725	5	25	1820	8.6	FDD	IMD4
	n7	2565	5	25	2685	N/A	FDD	N/A
	n78	3475	10	50	3475	N/A	TDD	N/A
	n3	1730	5	25	1825	N/A	FDD	N/A
	n7	2560	5	25	2680	N/A	FDD	N/A
	n78	3390	10	50	3390	16.1	TDD	IMD3

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n3-n8-n78	n3	1730	5	25	1825	N/A	FDD	N/A
	n8	910	5	25	955	N/A	FDD	N/A
	n78	3550	10	50	3550	16.1	TDD	IMD3
	n3	1730	5	25	1825	N/A	FDD	N/A
	n8	910	5	25	955	N/A	FDD	N/A
	n78	3370	10	50	3370	4.5	TDD	IMD5
	n3	1725	5	25	1820	15.7	FDD	IMD3
	n8	910	5	25	955	N/A	FDD	N/A
	n78	3640	10	50	3640	N/A	TDD	N/A
CA_n3-n18-n41	n18	820	5	25	865	N/A	FDD	N/A
	n3	1720	5	25	1815	N/A	FDD	N/A
	n41	2540	10	50	2540	[N/A]1	TDD	IMD2
	n18	820	5	25	865	N/A	FDD	N/A
	n3	1725	5	25	1820	N/A	FDD	N/A
	n41	2630	10	50	2630	16.0	TDD	IMD3
	n18	820	5	25	865	28.9	FDD	IMD2
	n3	1765	5	25	1860	N/A	FDD	N/A
	n41	2630	10	50	2630	N/A	TDD	N/A
	n18	830	5	25	875	[19.0]	FDD	IMD3
	n3	1725	5	25	1820	N/A	FDD	N/A
	n41	2670	5	25	2670	N/A	TDD	N/A
	n3	1755	5	25	1850	28.8	FDD	IMD2
	n41	2670	10	50	2670	N/A	TDD	N/A
	n18	820	5	25	865	N/A	FDD	N/A
CA_n3-n28-n41	n3	1715	5	25	1810	N/A	FDD	N/A
	n28	743	5	25	798	N/A	FDD	N/A
	n41	2518	5	25	2518	27.4	TDD	IMD2
	n3	1715	5	25	1810	N/A	FDD	N/A
	n28	743	5	25	798	N/A	FDD	N/A
	n41	2687	5	25	2687	15.9	TDD	IMD3
CA_n3-n28-n77	n3	1720	5	25	1815	N/A	FDD	N/A
	n28	733	5	25	788	N/A	FDD	N/A
	n77	4173	10	50	4173	15.9	TDD	IMD3
	n28	735	5	25	790	N/A	FDD	N/A
	n77	3320	10	50	3320	N/A	TDD	N/A
	n3	1755	5	25	1850	17.0	FDD	IMD3
	n3	1712.5	5	25	1807.5	N/A	FDD	N/A
	n77	4195	10	50	4195	N/A	TDD	N/A
	n28	715	5	25	770	15.3	FDD	IMD3
CA_n3-n28-n78	n28	735	5	25	790	N/A	FDD	N/A
	n78	3320	10	50	3320	N/A	TDD	IMD3
	n3	1755	5	25	1850	17.3	FDD	N/A
	n3	1750	5	25	1845	N/A	FDD	N/A
	n28	743	5	25	798	N/A	FDD	N/A
	n78	3764	10	50	3764	4.5	TDD	IMD5
CA_n3-n28-n79	n3	1770	5	25	1865	N/A	N/A	n3
	n28	725	5	25	780	N/A	N/A	n28
	n79	4585	40	216	4585	9.4	IMD4[1]|	n79
	n3	1770	5	25	1865	N/A	N/A	n3
	n79	4530	40	216	4530	N/A	N/A	n79
	n28	725	5	25	780	10.3	IMD4	n28
	n28	725	5	25	780	N/A	N/A	n28
	n79	4770	40	216	4770	N/A	N/A	n79
	n3	1775	5	25	1870	5.7	IMD5	n3

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n3-40-n41	n3	1747.5	5	25	1842.5	1.0	FDD	IMD5
	n40	2347.5	5	25	2347.5	N/A	TDD	N/A
	n41	2600	10	50	2600	N/A	TDD	N/A
CA_n3-n41-n77	n3	1720	5	25	1815	N/A	FDD	N/A
	n77	3900	10	50	3900	N/A	TDD	N/A
	n41	2640	5	25	2640	5.3	TDD	IMD5
	n41	2620	5	25	2620	N/A	TDD	N/A
	n77	3400	10	50	3400	N/A	TDD	N/A
	n3	1745	5	25	1840	16.4	FDD	IMD3
	n41	2580	5	25	2580	N/A	TDD	N/A
	n3	1720	5	25	1815	N/A	FDD	N/A
	n77	3440	10	50	3440	16.8	TDD	IMD31
CA_n3-n41-n78	n3	1730	5	25	1825	N/A	FDD	N/A
	n41	2560	10	50	2560	N/A	TDD	N/A
	n78	3390	10	50	3390	16.4	TDD	IMD3
	n3	1745	5	25	1840	16.4	TDD	IMD3
	n41	2620	5	25	2620	N/A	FDD	N/A
	n78	3400	10	50	3400	N/A	TDD	N/A
CA_n3-n77-n79	n77	TBD	TBD	TBD	TBD	N/A	FDD	N/A
	n79	TBD	TBD	TBD	TBD	N/A	TDD	N/A
	n3	TBD	TBD	TBD	TBD	TBD	TDD	IMD3[1, 2]
CA_n5-n7-n78	n5	834	5	25	879	30.2	FDD	IMD2
	n7	2550	5	25	2670	N/A	FDD	N/A
	n78	3429	10	50	3429	N/A	TDD	N/A
	n5	830	5	25	875	3.3	FDD	IMD5
	n7	2525	5	25	2645	N/A	FDD	N/A
	n78	3350	10	50	3350	N/A	TDD	N/A
	n5	844	5	25	889	N/A	FDD	N/A
	n7	2525	5	25	2645	30.1	FDD	IMD2
	n78	3489	10	50	3489	N/A	TDD	N/A
	n5	835	5	25	880	N/A	FDD	N/A
	n7	2540	5	25	2660	N/A	FDD	N/A
	n78	3375	10	50	3375	29.7	TDD	IMD2
	n5	835	5	25	880	N/A	FDD	N/A
	n7	2550	5	25	2670	N/A	FDD	N/A
	n78	3430	10	50	3430	9.7	TDD	IMD4

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n5-n12-n77	n5	835	5	25	880	3.9	FDD	IMD5
	n12	707.5	5	25	737.5	N/A	FDD	N/A
	n77	3710	10	50	3710	N/A	TDD	N/A
	n5	835	5	25	880	N/A	FDD	N/A
	n12	710	5	25	740	4.4	FDD	IMD5
	n77	4080	10	50	4080	N/A	TDD	N/A
	n5	830	5	25	875	N/A	FDD	N/A
	n12	707.5	5	25	737.5	N/A	FDD	N/A
	n77	3905	10	50	3905	4.4	TDD	IMD5
CA_n5-n14-n77	n5	835	5	25	880	3.9	FDD	IMD5
	n14	793	5	25	763	N/A	FDD	N/A
	n77	4052	10	50	4052	N/A	TDD	N/A
	n5	846.5	5	25	891.5	N/A	FDD	N/A
	n14	795.5	5	25	765.5	11.6	FDD	IMD4[1]
	n77	3305	10	50	3305	N/A	TDD	N/A
	n5	835	5	25	880	N/A	FDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n77	3298	10	50	3298	10.3	TDD	IMD4[1]
CA_n5-n25-n66	n5	834	5	25	879	N/A	FDD	N/A
	n25	1900	5	25	1980	N/A	FDD	N/A
	n66	1712	5	25	2132	7.2	FDD	IMD4
CA_n5-n25-n77	n5	830	5	25	875	N/A	FDD	N/A
	n25	1880	5	25	1960	N/A	FDD	N/A
	n77	3540	10	50	3540	16.0	TDD	IMD3
	n5	844	5	25	889	3.8	FDD	IMD5
	n25	1907	5	25	1987	N/A	FDD	N/A
	n77	3305	10	50	3305	N/A	TDD	N/A
	n5	846.5	5	25	891.5	N/A	FDD	N/A
	n25	1907	5	25	1987	16.5	FDD	IMD3
	n77	3680	10	25	3680	N/A	TDD	N/A
CA_n5-n25-n78	n5	830	5	25	875	N/A	FDD	N/A
	n25	1900	5	25	1980	N/A	FDD	N/A
	n78	3560	10	50	3560	16.1	TDD	IMD3
CA_n5-n30-n66	n5	830	5	25	875	N/A	FDD	N/A
	n30	2307.5	5	25	2352.5	N/A	FDD	N/A
	n66	1725	5	25	2125	4	FDD	IMD5
CA_n5-n30-n77	n5	835	5	25	880	15.2	FDD	IMD3
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3740	10	50	3740	N/A	TDD	N/A
	n5	835	5	25	880	N/A	FDD	N/A
	n30	2310	5	25	2355	13.2	FDD	IMD3
	n77	4025	10	50	4025	N/A	TDD	N/A
	n5	840	5	25	885	N/A	FDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3780	10	50	3780	16.1	TDD	IMD3

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n5-n66-n77	n5	830	5	25	875	N/A	FDD	N/A
	n66	1750	5	25	2150	N/A	FDD	N/A
	n77	3410	10	50	3410	16.1	TDD	IMD3
	n5	826.5	5	25	871.5	N/A	FDD	N/A
	n66	1712.5	5	25	2112.5	N/A	FDD	N/A
	n77	4192	10	50	4192	8.2	TDD	IMD4
	n5	830	5	25	875	N/A	FDD	N/A
	n66	1750	5	25	2150	N/A	FDD	N/A
	n77	3590	10	50	3590	3.3	TDD	IMD5
	n5	830	5	25	875	N/A	FDD	N/A
	n66	1730	5	25	2130	14.4	FDD	IMD3
	n77	3790	10	50	3790	N/A	TDD	N/A
CA_n5-n66-n78	n5	830	5	25	875	N/A	FDD	N/A
	n66	1720	5	25	2120	N/A	FDD	N/A
	n78	3380	10	50	3380	16.1	TDD	IMD3
CA_n5-n66-n78	n5	830	5	25	875	N/A	FDD	N/A
	n66	1720	5	25	2120	13.2	FDD	IMD3
	n78	3780	10	50	3780	N/A	TDD	N/A
CA_n7-n25-n78	n7	2550	5	25	2670	N/A	FDD	N/A
	n25	1870	5	25	1950	8.6	FDD	IMD4
	n78	3525	10	50	3525	N/A	TDD	N/A
	n7	2520	5	25	2640	N/A	FDD	N/A
	n25	1905	5	25	1985	N/A	FDD	N/A
	n78	3750	10	50	3750	4.5	TDD	IMD5
CA_n7-n28-n78	n7	2567.5	5	25	2687.5	N/A	FDD	N/A
	n28	727.5	5	25	782.5	28.8	FDD	IMD2
	n78	3350	10	50	3350	N/A	TDD	N/A
	n7	2567.5	5	25	2687.5	N/A	FDD	N/A
	n28	727.5	5	25	782.5	3.0	FDD	IMD5
	n78	3460	10	50	3460	N/A	TDD	N/A
	n7	2530	5	25	2650	30.5	FDD	IMD2
	n28	740	5	25	795	N/A	FDD	N/A
	n78	3390	10	50	3390	N/A	TDD	N/A
	n7	2565	5	25	2685	N/A	FDD	N/A
	n28	745	5	25	800	N/A	FDD	N/A
	n78	3310	10	50	3310	29.7	TDD	IMD2
	n7	2550	5	25	2670	N/A	FDD	N/A
	n28	720	5	25	775	N/A	FDD	N/A
	n78	3714	10	50	3714	9.7	TDD	IMD4
CA_n7-n66-n77	n7	2560	5	25	2680	N/A	FDD	N/A
	n66	1730	5	25	2130	N/A	FDD	N/A
	n77	3390	10	50	3390	16.1	TDD	IMD3
	n7	2550	5	25	2670	N/A	FDD	N/A
	n66	1750	5	25	2150	8.7	FDD	IMD4
	n77	3625	10	50	3625	N/A	TDD	N/A
	n7	2520	5	25	2640	3.4	FDD	IMD5
	n66	1720	5	25	2120	N/A	FDD	N/A
	n77	3900	10	50	3900	N/A	TDD	N/A
	n7	2520	5	25	2640	N/A	FDD	N/A
	n66	1760	5	25	2160	N/A	FDD	N/A
	n77	4040	10	50	4040	4.2	TDD	IMD5
CA_n7-n66-n78	n7	2560	5	25	2680	N/A	FDD	N/A
	n66	1730	5	25	2130	N/A	FDD	N/A
	n78	3390	10	50	3390	16.1	TDD	IMD3
	n7	2550	5	25	2670	N/A	FDD	N/A
	n66	1750	5	25	2150	8.7	FDD	IMD4
	n78	3625	10	50	3625	N/A	TDD	N/A

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n12-n30-n77	n12	710	5	25	740	15.2	FDD	IMD3[1]
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3880	10	50	3880	N/A	TDD	N/A
	n12	707.5	5	25	737.5	N/A	FDD	N/A
	n30	2310	5	25	2355	13.2	FDD	IMD3
	n77	3770	10	50	3770	N/A	TDD	N/A
	n12	707	5	25	737	N/A	FDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3913	10	50	3913	16.0	TDD	IMD3
CA_n12-n66-n77	n12	710	5	25	740	15.2	FDD	IMD3
	n66	1720	5	25	2120	N/A	FDD	N/A
	n77	4180	10	50	4180	N/A	TDD	N/A
	n12	707	5	25	737	N/A	FDD	N/A
	n66	1746	5	25	2146	13.2	FDD	IMD3
	n77	3560	10	50	3560	N/A	TDD	N/A
	n12	704	5	25	734	N/A	FDD	N/A
	n66	1723	5	25	2123	N/A	FDD	N/A
	n77	4150	10	50	4150	16.0	TDD	IMD3[1,2]
CA_n13-n25-n66	n13	782	5	25	751	N/A	FDD	N/A
	n66	1736	5	25	2156	7..2	FDD	IMD4
	n25	1860	5	25	1940	N/A	FDD	N/A
	n13	780	10	50	749	N/A	FDD	N/A
	n25	1860	5	25	1940	6.2	FDD	IMD4
	n66	1750	5	25	2150	N/A	FDD	N/A
CA_n13-n25-n77	n13	782	5	25	751	N/A	FDD	N/A
	n25	1880	5	25	1960	N/A	FDD	N/A
	n77	3444	10	50	3444	17.3	TDD	IMD3[1,2]
	n13	782	5	25	751	N/A	FDD	N/A
	n25	1880	5	25	1960	16.0	FDD	IMD3
	n77	3524	10	50	3524	N/A	TDD	N/A
CA_n13-n66-n77	n13	782	5	25	751	N/A	FDD	N/A
	n66	1736	5	25	2136	17.1	FDD	IMD3
	n77	3700	10	50	3700	N/A	TDD	N/A
	n13	781	5	25	750	15.2	FDD	IMD3
	n66	1710	5	25	2110	N/A	FDD	N/A
	n77	4170	10	50	4170	N/A	TDD	N/A
	n13	782	5	25	751	N/A	FDD	N/A
	n66	1770	5	25	2170	N/A	FDD	N/A
	n77	3334	10	50	3334	16.3	TDD	IMD3[1,2]
CA_n14-n30-n77	n14	793	5	25	763	15.2	FDD	IMD3[1]
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3857	10	50	3857	N/A	TDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n30	2310	5	25	2355	13.2	FDD	IMD3
	n77	3941	10	50	3941	N/A	TDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n77	3896	10	50	3896	16.0	TDD	IMD3
CA_n14-n66-n77	n14	793	5	25	763	15.2	FDD	IMD3
	n66	1712.5	5	25	2112.5	N/A	FDD	N/A
	n77	4188	10	50	4188	N/A	TDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n66	1755	5	25	2155	13.2	FDD	IMD3
	n77	3741	10	50	3741	N/A	TDD	N/A
	n14	793	5	25	763	N/A	FDD	N/A
	n66	1755	5	25	2155	N/A	FDD	N/A
	n77	3341	10	50	3341	16.0	TDD	IMD3[1,2]

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	NR band	UL F_c (MHz)	UL/DL BW (MHz)	UL C_{LRB}	DL F_c (MHz)	MSD (dB)	Duplex mode	
CA_n25-n38-n78	n25	1852.5	5	25	1932.5	16.4	FDD	IMD3
	n38	2617.5	5	25	2617.5	N/A	TDD	N/A
	n78	3305	10	50	3305	N/A	TDD	N/A
	n25	1870	5	25	1950	N/A	FDD	N/A
	n38	2610	5	25	2610	N/A	TDD	N/A
	n78	3350	10	50	3350	14.8	TDD	IMD3
	n25	1880	5	25	1960	8.6	TDD	IMD4
	n38	2570	5	25	2570	N/A	FDD	N/A
	n78	3550	10	50	3550	N/A	TDD	N/A
CA_n25-n41-n66	n25	1860	5	25	1940	11.0	FDD	IMD4
	n41	2685	10	50	2685	N/A	TDD	N/A
	n66	1715	5	25	2115	N/A	FDD	N/A
CA_n25-n41-n77	n25	1870	5	25	1950	N/A	FDD	N/A
	n41	2610	5	25	2610	N/A	TDD	N/A
	n77	3350	10	50	3350	14.8	TDD	IMD3
	n25	1900	5	25	1980	N/A	FDD	N/A
	n41	2525	5	25	2645	N/A	TDD	N/A
	n77	3775	10	50	3775	4.2	TDD	IMD5
	n25	1870	5	25	1950	N/A	FDD	N/A
	n41	2640	5	25	2640	5.3	TDD	IMD5
	n77	4125	10	50	4125	N/A	TDD	N/A
	n25	1870	5	25	1950	17.6	FDD	IMD3
	n41	2565	5	25	2565	N/A	TDD	N/A
	n77	3180	10	50	3310	N/A	TDD	N/A
	n25	1870	5	25	1950	8.6	FDD	IMD4
	n41	2550	5	25	2685	N/A	TDD	N/A
	n77	3525	10	50	3475	N/A	TDD	N/A
CA_n25-n41-n78	n25	1870	5	25	1950	N/A	FDD	N/A
	n41	2610	5	25	2610	N/A	TDD	N/A
	n78	3350	10	50	3350	14.8	TDD	IMD3
	n25	1900	5	25	1980	N/A	FDD	N/A
	n41	2525	5	25	2645	N/A	TDD	N/A
	n78	3775	10	50	3775	4.2	TDD	IMD5
	n25	1870	5	25	1950	17.6	FDD	IMD3
	n41	2565	5	25	2565	N/A	TDD	N/A
	n78	3180	10	50	3310	N/A	TDD	N/A
	n25	1870	5	25	1950	8.6	FDD	IMD4
	n41	2550	5	25	2685	N/A	TDD	N/A
	n78	3525	10	50	3475	N/A	TDD	N/A
CA_n25-n48-n66	n25	1900	5	25	1980	N/A	FDD	N/A
	n48	3540	10	50	3540	N/A	TDD	N/A
	n66	1760	5	25	2160	10.4	FDD	IMD4
	n25	1880	5	25	1960	N/A	FDD	N/A
	n48	3620	10	50	3620	29.4	TDD	IMD2
	n66	1740	5	25	2140	N/A	FDD	N/A
	n25	1880	5	25	1960	32.1	FDD	IMD2[1]
	n48	3700	10	50	3700	N/A	TDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n25-n66-n77	n25	1900	5	25	1980	N/A	FDD	N/A
	n66	1760	5	25	2160	29.2	FDD	IMD2
	n77	4060	10	50	4060	N/A	TDD	N/A
	n25	1900	5	25	1980	N/A	FDD	N/A
	n66	1760	5	25	2160	10.4	FDD	IMD4
	n77	3540	10	50	3540	10	TDD	N/A
	n25	1900	5	25	1980	N/A	FDD	N/A
	n66	1760	5	25	2160	4.0	FDD	IMD5
	n77	3930	10	50	3930	N/A	TDD	N/A
	n25	1880	5	25	1960	32.1	FDD	IMD2
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3700	10	50	3700	N/A	TDD	N/A
	n25	1880	5	25	1960	9.1	FDD	IMD4
	n66	1770	5	25	2170	N/A	FDD	N/A
	n77	3350	10	50	3350	N/A	TDD	N/A
	n25	1880	5	25	1960	2.1	FDD	IMD5
	n66	1760	5	25	2160	N/A	FDD	N/A
	n77	3620	10	50	3620	N/A	TDD	N/A
	n25	1880	5	25	1960	N/A	FDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3620	10	50	3620	29.4	TDD	IMD2
	n25	1880	5	25	1960	N/A	FDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A
	n77	3340	10	50	3340	8.9	TDD	IMD4
CA_n25-n66-n78	n25	1880	5	25	1960	N/A	FDD	N/A
	n66	1740	5	25	2140	N/A	FDD	N/A
	n78	3620	10	50	3620	29.4	TDD	IMD2
CA_n25-n71-n77	n25	1907.5	5	25	1987.5	N/A	FDD	N/A
	n71	695.5	5	25	649.5	N/A	FDD	N/A
	n77	3305	10	50	3305	8.0	TDD	IMD3[1,2]
	n25	1874	5	25	1954	16.5	FDD	IMD3[2]
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3340	10	50	3340	N/A	TDD	N/A
CA_n25-n71-n78	n25	1907.5	5	25	1987.5	N/A	FDD	N/A
	n71	695.5	5	25	649.5	N/A	FDD	N/A
	n78	3305	10	50	3305	8.0	TDD	IMD3
	n25	1874	5	25	1954	16.5	FDD	IMD3
	n71	693	5	25	647	N/A	FDD	N/A
	n78	3340	10	50	3340	N/A	TDD	N/A

Band / Channel bandwidth / N_{RB} / Duplex mode								**Source of IMD**
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n28-n41-n77	n41	2642	5	25	2642	N/A	TDD	N/A
	n77	3440	10	50	3440	N/A	TDD	N/A
	n28	743	5	25	798	30.8	FDD	IMD2[4]
	n41	2567.5	10	50	2567.5	N/A	TDD	N/A
	n77	3460	10	50	3460	N/A	TDD	N/A
	n28	727.5	5	25	782.5	3.0	FDD	IMD5
	n28	738	5	25	793	N/A	FDD	N/A
	n77	3380	10	50	3380	N/A	TDD	N/A
	n41	2642	5	25	2642	29.5	TDD	IMD2
	n41	2580	5	25	2580	N/A	TDD	N/A
	n28	743	5	25	798	N/A	FDD	N/A
	n77	3323	10	50	3323	28.2	TDD	IMD2[4]
CA_n28-n41-n78	n28	738	5	25	793	N/A	FDD	N/A
	n78	3380	10	50	3380	N/A	TDD	N/A
	n41	2642	5	25	2642	29.5	TDD	IMD2
	n41	2642	5	25	2642	N/A	TDD	N/A
	n78	3440	10	50	3440	N/A	TDD	N/A
	n28	743	5	25	798	30.8	FDD	IMD2[1]
	n41	2565	5	25	2565	N/A	TDD	N/A
	n28	745	5	25	800	N/A	FDD	N/A
	n78	3310	10	50	3310	29.7	TDD	IMD2[2]
CA_n28-n41-n79	n28	725	5	25	780	13.0	FDD	IMD3[1]
	n41	2600	10	50	2600	N/A	TDD	N/A
	n79	4600	40	216	4600	N/A	TDD	N/A
	n28	720	5	25	780	N/A	FDD	N/A
	n41	2600	10	50	2600	N/A	TDD	N/A
	n79	4480	40	216	4600	10.1	TDD	IMD3[2]
	n28	735	5	25	790	N/A	FDD	N/A
	n41	2645	10	50	2645	10.4	TDD	IMD4
	n79	4850	40	216	4850	N/A	TDD	N/A
CA_n28-n77-n79	n77	3620	10	52	3620	N/A	N/A	n77
	n79	4420	40	216	4420	N/A	N/A	n79
	n28	745	5	25	800	16.2	IMD2[1,2]	n28
CA_n30-n66-n77	n30	2310	5	25	2355	29.2	FDD	IMD2[1]
	n66	1745	5	25	2145	N/A	FDD	N/A
	n77	4100	10	50	4100	N/A	TDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n66	1760	5	25	2160	8.7	FDD	IMD4
	n77	3390	10	50	3390	N/A	TDD	N/A
	n30	2310	5	25	2355	N/A	FDD	N/A
	n66	1745	5	25	2145	N/A	FDD	N/A
	n77	4055	10	50	4055	28.4	TDD	IMD2[1]
CA_n38-n66-n78	n38	2550	5	25	2550	N/A	TDD	N/A
	n66	1750	5	25	2150	8.7	FDD	IMD4
	n78	3625	10	50	3625	N/A	TDD	N/A
	n38	2610	5	25	2610	N/A	TDD	N/A
	n66	1760	5	25	2160	N/A	FDD	N/A
	n78	3460	10	50	3460	15.0	TDD	IMD3
CA_n39-n40-n79	n39	1917.5	5	25	1917.5	N/A	TDD	N/A
	n40	2302.5	5	25	2302.5	N/A	TDD	N/A
	n79	4980	40	216	4980	5.8	TDD	IMD4
CA_n40-n41-n79	n40	2340	5	25	2340	N/A	TDD	N/A
	n41	2600	10	50	2600	N/A	TDD	N/A
	n79	4940	40	216	4940	30.5	TDD	IMD2

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n41-n66-n77	n41	2560	5	25	2560	N/A	TDD	N/A
	n66	1730	5	25	2130	N/A	FDD	N/A
	n77	3390	10	50	3390	16.1	TDD	IMD3[1,2]
	n41	2670	5	25	2670	5.2	TDD	IMD5
	n66	1715	5	25	2115	N/A	FDD	N/A
	n77	4190	10	50	4190	N/A	TDD	N/A
	n41	2530	5	25	2530	N/A	TDD	N/A
	n66	1760	5	25	2160	9.0	FDD	IMD4
	n77	3610	10	50	3610	N/A	TDD	N/A
CA_n41-n66-n78	n41	2560	5	25	2560	N/A	TDD	N/A
	n66	1730	5	25	2130	N/A	FDD	N/A
	n77	3390	10	50	3390	16.1	TDD	IMD3[1]
	n41	2530	5	25	2530	N/A	TDD	N/A
	n66	1760	5	25	2160	9.0	FDD	IMD4
	n77	3610	10	50	3610	N/A	TDD	N/A
CA_n41-n71-n77	n41	2615	5	25	2615	N/A	TDD	N/A
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3308	10	50	3308	29.1	TDD	IMD2[1]
	n41	2615	5	25	2615	N/A	TDD	N/A
	n71	693	5	25	647	N/A	FDD	N/A
	n77	4001	10	50	4001	16.3	TDD	IMD3[1]
	n41	2580	5	25	2580	N/A	TDD	N/A
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3774	10	50	3774	10.3	TDD	IMD4[1]
	n41	2615	5	25	2615	28.7	TDD	IMD2
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3308	10	50	3308	N/A	TDD	N/A
	n41	2615	5	25	2615	15.5	TDD	IMD3
	n71	693	5	25	647	N/A	FDD	N/A
	n77	4001	10	50	4001	N/A	TDD	N/A
	41	2642	5	25	2642	N/A	TDD	N/A
	n71	743	5	25	798	30.8	FDD	IMD2
	n77	3440	10	50	3440	N/A	TDD	N/A
CA_n41-n71-n78	n41	2615	5	25	2615	N/A	TDD	N/A
	n71	693	5	25	647	N/A	FDD	N/A
	n78	3308	10	50	3308	29.1	TDD	IMD2[1]
	n41	2580	5	25	2580	N/A	TDD	N/A
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3774	10	50	3774	10.3	TDD	IMD4[1]
	n41	2615	5	25	2615	28.7	TDD	IMD2
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3308	10	50	3308	N/A	TDD	N/A
	41	2642	5	25	2642	N/A	TDD	N/A
	n71	743	5	25	798	30.8	FDD	IMD2
	n77	3440	10	50	3440	N/A	TDD	N/A
CA_n48-n66-n70	n48	3625	10	50	3625	N/À	TDD	N/A
	n66	1742.5	5	25	2142.5	2.8	FDD	IMD5
	n70	1702.5	5	25	2002.5	N/A	FDD	N/A
CA_n48-n66-n71	n48	3552.5	10	50	3552.5	N/A	TDD	N/A
	n66	1761.5	5	25	2161.5	14.4	FDD	IMD3
	n71	695.5	5	25	649.5	N/A	FDD	N/A
	n48	3695	10	50	3695	5.2	TDD	IMD4
	n66	1712.5	5	25	2112.5	N/A	FDD	N/A
	n71	665.5	5	25	619.5	N/A	FDD	N/A

Band / Channel bandwidth / N_{RB} / Duplex mode								Source of IMD
NR CA band combination	**NR band**	**UL F_c (MHz)**	**UL/DL BW (MHz)**	**UL C_{LRB}**	**DL F_c (MHz)**	**MSD (dB)**	**Duplex mode**	
CA_n48-n70-n71	n48	3694	10	50	3694	9	TDD	IMD4[1]
	n70	1697.5	5	25	1997.5	N/A	FDD	N/A
	n71	665.5	5	25	619.5	N/A	FDD	N/A
CA_n66-n71-n77	n66	1720	5	25	2120	N/A	FDD	N/A
	n71	668	5	25	622	N/A	FDD	N/A
	n77	4108	10	50	4108	15.9	TDD	IMD3[1,2]
	n66	1760	5	25	2160	15.5	FDD	IMD3[2]
	n71	693	5	25	647	N/A	FDD	N/A
	n77	3546	10	50	3546	N/A	TDD	N/A
	n66	1720	5	25	2120	N/A	FDD	N/A
	n71	686	5	25	640	15.3	FDD	IMD3
	n77	4080	10	50	4080	N/A	TDD	N/A
CA_n66-n71-n78	n66	1720	5	25	2120	N/A	FDD	N/A
	n71	668	5	25	622	N/A	FDD	N/A
	n78	3724	10	50	3724	9	TDD	IMD41
	n66	1760	5	25	2160	15.5	FDD	IMD3
	n71	693	5	25	647	N/A	FDD	N/A
	n78	3546	10	50	3546	N/A	TDD	N/A

NOTE 1: This band is subject to IMD5 also which MSD is not specified.
NOTE 2: This band is subject to IMD4 also which MSD is not specified.
NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.
NOTE 4: This band is subject to IMD3 also which MSD is not specified.
NOTE 5: Both of the transmitters shall be set min(+20 dBm, $P_{CMAX\_L,f,c}$) as defined in clause 6.2A.4

7.3A.0.6 Reference sensitivity exceptions due to cross band isolation for CA

Sensitivity degradation is allowed for a band if it is impacted by UL of another band part of the same NR CA configuration due to cross band isolation issues. Reference sensitivity exceptions for the victim band are specified in Table 7.3A.0.6-1 with uplink configuration of the aggressor band specified in Table 7.3A.0.6-2.

Table 7.3A.0.6-1: Reference sensitivity exceptions (MSD) due to cross band isolation for NR CA FR1

NR Band / Channel bandwidth of the affected DL band														
UL band	DL band	5 MHz (dB)	10 MHz (dB)	15 MHz (dB)	20 MHz (dB)	25 MHz (dB)	30 MHz (dB)	40 MHz (dB)	50 MHz (dB)	60 MHz (dB)	70 MHz (dB)	80 MHz (dB)	90 MHz (dB)	100 MHz (dB)
n1	n3	3	2.2	1.9	1.7	1.6	1.5	1.4						
n3	n41		0.7	0.7	0.7			0.7	0.7	0.7		0.7	0.7	0.7
n41	n3	0.6	0.6	0.6	0.6	0.6	0.6							
n71	n29	17.5	16.0											
n78	n7[1]	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5					
n78	n41[1]		4.5	4.5	4.5			4.5	4.5					
n78	n79							2	2	2		2		2
n79	n78		2.6	2.6	2.6			2.6	2.6	2.6		2.6	2.6	2.6
	NOTE 1: Applicable only when harmonic mixing MSD for this combination is not applied. NOTE 2: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.													

Table 7.3A.0.6-2: Uplink configuration for reference sensitivity exceptions due to cross band isolation for NR CA FR1

NR Band / SCS / Channel bandwidth of the affected DL band															
UL band	**DL band**	**SCS of UL band (kHz)**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**70 MHz**	**80 MHz**	**90 MHz**	**100 MHz**
n1	n3	15	25	25	25	25	25	25	25						
n3	n41	15		50	50	50			50	50	50		50	50	50
n41	n3	30	160	160	160	160	160	160							
n71	n29	15	20	20											
n78	n7	30	270	270	270	270	270	270	270	270					
n78	n41	30		270	270	270			270	270	270		270	270	270
n78	n79	30							270[2]	270[2]	270[2]		270[2]		270[2]
n79	n78	30		270[2]	270[2]	270[2]			270[2]	270[2]	270[2]		270[2]	270[2]	270[2]
	NOTE 1: The UL configuration applies regardless of the channel bandwidth of the UL band unless the UL resource blocks exceed that specified in Table 7.3.2.3-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2.3-3 applies. NOTE 2: Refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth in Table 5.3.2-1. NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.														

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3.A.

7.3A.1 Reference sensitivity power level for 2DL CA without exception

7.3A.1.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise when no CA exceptions are allowed and single carrier requirements apply.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area.

7.3A.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 2DL CA.

7.3A.1.3 Minimum requirements

The minimum conformance requirements are defined in clause 7.3A.0.

7.3A.1.4 Test description

7.3A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.1.4.1-1: Test Configuration Table for intra-band contiguous 2DL CA without exception

<table>
<tr><th colspan="8">Initial Conditions</th></tr>
<tr><td colspan="4">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="4">Normal, TL/VL, TL/VH, TH/VL, TH/VH</td></tr>
<tr><td colspan="4">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="4">Low range, High range</td></tr>
<tr><td colspan="4">Test CC Combination setting (N_{RB_agg}) as specified in subclause Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="4">Lowest N_{RB_agg}, Highest N_{RB_agg}
(NOTE 3)</td></tr>
<tr><td colspan="4">Test SCS as specified in Table 5.3.5-1</td><td colspan="4">Lowest</td></tr>
<tr><th colspan="8">Test Parameters CA Configurations</th></tr>
<tr><th colspan="2">CA Configuration /NRB</th><th colspan="2">DL Allocation</th><th colspan="4">UL Allocation</th></tr>
<tr><th>PCC NRB</th><th>SCC NRB</th><th>CC MOD</th><th>PCC & SCC RB allocation</th><th>CC MOD</th><th colspan="3">PCC & SCC RB allocations (L_{CRB} @ RB_{start})</th></tr>
<tr><td>Lowest N_{RB_agg} (NOTE 4)</td><td>Lowest N_{RB_agg} (NOTE 4)</td><td>CP-OFDM QPSK</td><td>Full RB</td><td>DFT-s-OFDM QPSK</td><td>REFSENS</td><td colspan="2">-</td></tr>
<tr><td>Highest N_{RB_agg} (NOTE 4)</td><td>Highest N_{RB_agg} (NOTE 4)</td><td>CP-OFDM QPSK</td><td>Full RB</td><td>DFT-s-OFDM QPSK</td><td>REFSENS</td><td colspan="2">-</td></tr>
<tr><td colspan="8">Note 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
Note 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.
Note 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested
Note 4: In CA_n66B configuration with the same N_{RB_agg} CC combination, PCC shall be selected as the lower CH BW
Note 5: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.</td></tr>
</table>

Table 7.3A.1.4.1-2: Test Configuration Table for inter-band 2DL CA without exception

Initial Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range for PCC and SCC with exceptions for CA configurations containing the following band combinations (Note 8): CA_n1-n77: Mid in band n1 and Low in band n77 CA_n3-n77: TBD in band 3 and TBD in band 77. CA_n8-nX: Low range for PCC in Band 8 CA_n70-n71: High range for PCC in band 71. CA_n3-n78: Mid in band 3 and High in band 78. CA_n5-n78: Mid in band 5 and High in band 78 CA_n29-n71: Low in band 29 and High in band 71..
Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Refer to "PCC N_{RB}"and "SCC N_{RB} " columns
Test SCS as specified in Table 5.3.5-1	Lowest
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters for CA Configurations											
ID	CA Configuration / CBW						DL Allocation			UL Allocation (Note 2,3)	
	CA Configuration				PCC N_{RB}	SCC N_{RB}	CC MOD	PCC & SCC RB allocation		CC MOD	PCC & SCC RB allocations (L_{CRB} @ RB_{start})
	PCC		SCC					PCC	SCC		
	Band	Range	Band	Range							

Default Test Settings for a CA_nXA-nYA Configuration											
1	nX	default	nY	default	Highest (Note 6)	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS	-
2	nY	default	nX	default	Highest (Note 6)	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS	-

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 3: X,Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A, X=1, Y=3.
Note 4: REFSENS refers to the PCC bands and PCC N_{RB} 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.
Note 5: For band combinations including operating band without uplink band (as noted in Table 5.2-1), only the CA configuration where PCC band has uplink band shall be tested.
Note 6: For NR band n70, DL 25 MHz / UL 15 MHz shall be configured (as specified in clause 5.3.6).
Note 7: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.
Note 8: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.
Note 9: CA_n29A-n71A is tested according to reference sensitivity levels specified in Clause 7.3A.1_1.5 due to cross band isolation exception specified in Table 7.3A.0.6-1

Table 7.3A.1.4.1-3: Test Configuration Table for intra-band non-contiguous 2DL CA without exception

Initial Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	For test frequencies refer to “Range” columns.
Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Refer to “PCC N_{RB}”and “SCC N_{RB} ” columns
Test SCS as specified in Table 5.3.5-1	Lowest
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters for CA Configurations												
ID	CA Configuration / CBW							DL Allocation			UL Allocation (Note 2,3)	
	CA Configuration				PCC	W_{gap} / [MHz]	SCC	CC MOD	PCC & SCC RB allocation		CC MOD	PCC & SCC RB allocations (L_{CRB} @ RB_{start})
	PCC		SCC						PCC	SCC		
	Band	Range	Band	Range								

Default Test Settings for a CA_nX(2A) Configuration												
1	nX	CC1	nX	CC2	Highest	Max (NOTE 4)	Lowest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS	-
2	nX	CC1	nX	CC2	Highest N_{RB_agg} (NOTE 5)	Max (NOTE 4)	Highest N_{RB_agg} (NOTE 5)	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS	-
Test Settings for a CA_n71(2A) Configuration												
1	n71	CC1	n71	CC2	5MHz	5.0	5MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	20@0	-
Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration. Note 2: Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points. Note 3: REFSENS refers to the PCC bands and PCC N_{RB} 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3. Note 4: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration Note 5: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested Note 6: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.												

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The UL and Reference Measurement Channel is set according to Tables 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3A.1.4.3.

7.3A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.1.4.3.
3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).
4. SS transmits PDSCH via PDCCH DCI format 1-1 for C_RNTI to transmit the DL RMC according to Tables 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1, 7.3.2.5-2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach P_{UMAX} level.
7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.3A.1.5 Test requirement

For 2DL carrier aggregation, test parameters are specified in table 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3. For the CA configurations listed in table 7.3A.1.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with reference power level specified in table 7.3.2.5-1 for non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by $\Delta R_{IB,c}$ defined in clause 7.3A.0.3 for the applicable operating bands. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

For intra-band non-contiguous 2 DL CA, the test requirement for shall be increased by ΔR_{IBNC} given in Table 7.3A.0.2.2-1 for the SCC. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.3.1-1) configured.

Table 7.3A.1.5-1: Reference sensitivity requirement for 2DL CA

Carrier aggregation type	DL CA configuration	UL CA configuration
Intra-band contiguous 2DL CA	CA_n40B	-
	CA_n41C	-
	CA_n66B	-
	CA_n77C	-
	CA_n78B	-
	CA_n78C	-
Intra-band non-contiguous 2DL CA	CA_n66(2A)	-
	CA_n77(2A)	-
	CA_n78(2A)	-
	CA_n71(2A)	-
Inter-band 2DL CA	CA_n1A-n3A	
	CA_n1A-n77A	-
	CA_n1A-n78A	-
	CA_n2A-n48A	-
	CA_n2A-n66A	-
	CA_n2A-n77A	-
	CA_n3A-n5A	
	CA_n3A-n41A	
	CA_n3A-n77A	-
	CA_n3A-n78A	-
	CA_n5A-n66A	-
	CA_n5A-n77A	-
	CA_n5A-n78A	
	CA_n8A-n78A	-
	CA_n24A-n41A	
	CA_n24A-n48A	
	CA_n24A-n77A	
	CA_n28A-n41A	-
	CA_n28A-n79A	-
	CA_n41A-n79A	-
	CA_n66A-n70A	-
	CA_n66A-n71A	-
	CA_n70A-n71A	-
SDL configuration	CA_n29A-n66A	-
	CA_n29A-n70A	-
	CA_n29A-n71A (NOTE 1)	-
Note 1: CA_n29A-71A reference sensitivity requirement is tested in Clause 7.3A.1_1 due to cross band isolation exception specified in Table 7.3A.0.6-1. Other Rx cases shall be tested with reference sensitivity levels defined in Clause 7.3A.1_1.5.		

Table 7.3A.1.5-2: Reference sensitivity for SDL bands

NR band	SCS (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
		dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
n29	15	-97.0 +TT	-93.8 +TT										
	30		-94.1 +TT										
Note 1: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.													

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) and parameters specified in Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, Table 7.3.2.4.1-3, Table 7.3.2.5-1, Table 7.3.2.5-2 and Table 7.3A.1.4-1 with the reference sensitivity power level increased by ΔR_{IBNC} given in Table 7.3A.0.2.2-1 for the SCC(s). For aggregation of two downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0.2.2-1. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.3.1-1) configured.

For band combinations including operating bands without uplink band (as noted in Table 5.2-1), the requirements are specified in Table 7.3A.1.5-1 and for any band with uplink the uplink configuration specified in Table 7.3.2.4.1-2. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels, as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one-sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal, as described in Annex A.5.1.1/A.5.2.1). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

7.3A.1_1 Reference sensitivity power level for 2DL CA exceptions

Editor’s Note: The following aspects are either missing or not yet determined:

- Test point analysis for CA_n3A-n5A IMD2 and IMD4 is currently missing in TR 38.905.

7.3A.1_1.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise when CA exceptions are allowed.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area.

7.3A.1_1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 2DL CA

7.3A.1_1.3 Minimum requirements

The minimum conformance requirements are defined in clause 7.3A.0.

7.3A.1_1.4 Test description

7.3A.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3A.1_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.1_1.4.1-1: Test Configuration Table for inter-band 2DL CA exceptions

Initial Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	For test frequencies refer to “Range” columns.
Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Refer to “PCC N_{RB}”and “SCC N_{RB} ” columns
Test SCS as specified in Table 5.3.5-1	Lowest
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters for CA Configurations												
ID	**CA Configuration / CBW**						**DL Allocation**			**UL Allocation (Note 2)**		
	CA Configuration				**PCC**	**SCC**	**CC MOD**	**PCC & SCC RB allocation**		**CC MOD**	**PCC & SCC RB allocations (L_{CRB} @ RB_{start})**	
	PCC		**SCC**					**PCC**	**SCC**			
	Band	**Range**	**Band**	**Range**								
Test Settings for CA_n1A-n3A Configuration												
1	n1	1950 MHz (UL)	n3	1760 MHz	5MHz	5MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
	n1	Low	n3	High	5MHz	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_4	
Test Settings for CA_n1A-n8A Configuration												
1	n1	1965 MHz (UL)	n8	887,5 MHz	5MHz	5MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n1A-n77A Configuration												
1	n1	Mid	n77	3900 MHz	20 MHz	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n1	Mid	n77	3870 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_1	-

Test Parameters for CA Configurations												
ID	CA Configuration / CBW						DL Allocation			UL Allocation (Note 2)	
	CA Configuration				PCC	SCC	CC MOD	PCC & SCC RB allocation		CC MOD	PCC & SCC RB allocations (L_{CRB} @ RB_{start})
	PCC		SCC					PCC	SCC		
	Band	Range	Band	Range							

Test Settings for CA_n1A-n78A Configuration											
1	n1	1950 MHz (UL)	n78	3710 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n2A-n48A Configuration											
1	n2	1860 MHz (UL)	n48	3700 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n2	UL 1852.5 /DL 1932.5	n48	3625 MHz	5 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n2A-n66A Configuration											
1	n2	UL 1855/ DL 1935	n66	UL 1775/ DL 2175	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
2	n2	UL 1883.3 /DL 1963.3	n66	UL 1750/ DL 2150	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n2A-n77A Configuration											
1	n2	1860 MHz (UL)	n77	3720 MHz	20 MHz	100 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n2	1860 MHz (UL)	n77	3700 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
3	n2	DL Mid	n77	3920 MHz	20 MHz	100 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	-	REFSENS_CA_2
4	n2	UL 1855/ DL 1935	n77	3790 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
5	n2	UL 1900/ DL 1980	n77	3720 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
6	n2	UL 1885/ DL 1965	n77	3810 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n3A-n5A Configuration											
1	n3	TBD	n77	TBD	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	**n3**	**1721** MHz **(UL)**	**n5**	**838 MHz**	**10 MHz**	**5 MHz**	**CP-OFDM QPSK**	**Full RB**	**DFT-s-OFDM QPSK**	**REFSENS_CA_3**	**REFSENS_CA_3**
Test Settings for CA_n3A-n77A Configuration											
1	n3	TBD	n77	TBD	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-

2	n3	TBD	n77	TBD	Highest	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
Test Settings for a CA_n5A_n66A Configuration											
1	n5	UL 838/DL 883	n66	UL 1721/ DL 2121	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for a CA_n5A_n77A Configuration											
1	n5	834 MHz (UL)	n77	3336 MHz	20 MHz	100 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n5	834 MHz (UL)	n77	4170 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
3	n5	DL Mid	n77	3526 MHz	10 MHz	100 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	-	REFSENS_CA_2
4	n5	UL 844/ DL 889	n77	3421 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
5	n5	UL 829/ DL 874	n77	4190 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n70A-n71A Configuration											
1	n71	Low	n70	Low	10 MHz	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1 with RB start 10	-
2	n71	Low	n70	Low	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1 with RB start 10	-
3	n70	1697.5 MHz (UL)	n71	695.5 MHz (UL)	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3

Test Parameters for CA Configurations												
ID	CA Configuration / CBW						DL Allocation			UL Allocation (Note 2)	
	CA Configuration				PCC	SCC	CC MOD	PCC & SCC RB allocation		CC MOD	PCC & SCC RB allocations (L_{CRB} @ RB_{start})
	PCC		SCC					PCC	SCC		
	Band	Range	Band	Range							

Test Settings for CA_n3A-n78A Configuration											
1	n3	Mid	n78	3495 MHz	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n3	Mid	n78	3465 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
3	n3	1740 MHz (UL)	n78	3575 ;MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
4	n3	1765 MHz (UL)	n78	3435 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n5A-n78A Configuration											
1	n5	Mid	n78	3346 MHz	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n5	Mid	n78	3316 MHz	20 MHz	20 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
Test Settings for CA_n7A-n78A Configuration											
1	n7	High	n78	Low	50 MHz	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_4	-
Test Settings for CA_n8A-n78A Configuration											
1	n8	Mid	n78	3590 MHz	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_1	-
2	n8	897.5 MHz (UL)	n78	3635 MHz	5 MHz	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n26A-n66A Configuration											
1	n66	1721 MHz (UL)	n26	838 MHz (UL)	5 MHz	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n29A-n71A Configuration											
1	n71	High	n29	Low	Highest	5 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_4	
2	n71	High	n29	Low	Highest	10 MHz	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS_CA_4	

Test Parameters for CA Configurations												
ID	CA Configuration / CBW						DL Allocation			UL Allocation (Note 2)		
	CA Configuration				PCC	SCC	CC MOD	PCC & SCC RB allocation		CC MOD	PCC & SCC RB allocations (L_{CRB} @ RB_{start})	
	PCC		SCC					PCC	SCC			
	Band	Range	Band	Range								
Test Settings for CA_n26A-n70A Configuration												
1	n70	1707.5 MHz (UL)	n26	838 MHz (UL)	5 MHz UL / 25 MHz DL	5 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n48A-n66A Configuration												
1	n48	3660 MHz (UL)	n66	1750 MHz (UL)	5 MHz	5 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
2	n66	High	n48	Low	5 MHz	10 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_1	-
3	n66	High	n48	Low	5 MHz	60 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_1	-
4	n66	High	n48	Mid	5 MHz	10 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_1	-
Test Settings for CA_n48A-n70A Configuration												
1	n48	3695 MHz (UL)	n70	1697.5 MHz (UL)	10 MHz	15 MHz UL / 25 MHz DL	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3
Test Settings for CA_n66A-n71A Configuration												
2	n66	1750 MHz (UL)	n71	675 MHz (UL)	5 MHz	5 MHz	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS_CA_3	REFSENS_CA_3

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: REFSENS refers to the PCC bands and PCC N_{RB} 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.
REFSENS_CA_1 refers to the Uplink RB allocation for reference sensitivity exceptions due to UL harmonic interference according to table 7.3A.0.4-2.
REFSENS_CA_2 refers to the Uplink RB allocation for reference sensitivity exceptions due to receiver harmonic mixing according to table 7.3A.0.4-4a.
REFSENS_CA_3 refers to the Uplink RB allocation for reference sensitivity exceptions due to intermodulation interference due to 2UL CA according to table 7.3A.0.5-1 for PC3 and table 7.3A.0.5-1a for PC2.
REFSENS_CA_4 refers to the Uplink RB allocation for reference sensitivity exceptions due to cross band isolation for NR CA FR1 according to table 7.3A.0.6-2.
Note 3: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.

Table 7.3A.1_1.4.1-2: Test Configuration Table for intra-band non-contiguous 2DL CA exceptions

<table>
<tr><th colspan="14">Initial Conditions</th></tr>
<tr><td colspan="8">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="6">NC, TL/VL, TL/VH, TH/VL, TH/VH</td></tr>
<tr><td colspan="8">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="6">For test frequencies refer to “Range” columns.</td></tr>
<tr><td colspan="8">Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="6">Refer to “PCC N_{RB}”and “SCC N_{RB} ” columns</td></tr>
<tr><td colspan="8">Test SCS as specified in Table 5.3.5-1</td><td colspan="6">Lowest</td></tr>
<tr><td colspan="8">Network signalling value</td><td colspan="6">NS_01
Unless given by Table 7.3.2.3-4 for the band with active uplink carrier</td></tr>
<tr><th colspan="14">Test Parameters for CA Configurations</th></tr>
<tr><th rowspan="4">ID</th><th colspan="7">CA Configuration / CBW</th><th colspan="3">DL Allocation</th><th colspan="3">UL Allocation (Note 2,3)</th></tr>
<tr><th colspan="4" rowspan="1">CA Configuration</th><th rowspan="3">PCC</th><th rowspan="3">W_{gap} / [MHz]</th><th rowspan="3">SCC</th><th rowspan="3">CC MOD</th><th colspan="2">PCC & SCC RB allocation</th><th rowspan="3">CC MOD</th><th colspan="2" rowspan="3">PCC & SCC RB allocations (L_{CRB} @ RB_{start})</th></tr>
<tr><th colspan="2">PCC</th><th colspan="2">SCC</th><th rowspan="2">PCC</th><th rowspan="2">SCC</th></tr>
<tr><th>Band</th><th>Range</th><th>Band</th><th>Range</th></tr>
<tr><td colspan="14">Test Settings for a CA_n71(2A) Configuration</td></tr>
<tr><td>1</td><td>n71</td><td>CC1</td><td>n71</td><td>CC2</td><td>5MHz</td><td>25.0</td><td>5MHz</td><td>CP-OFDM QPSK</td><td colspan="2">Full RB</td><td>DFT-s-OFDM QPSK</td><td>5@0</td><td>-</td></tr>
<tr><td>2</td><td>n71</td><td>CC1</td><td>n71</td><td>CC2</td><td>15MHz</td><td>10.0</td><td>10MHz</td><td>CP-OFDM QPSK</td><td colspan="2">Full RB</td><td>DFT-s-OFDM QPSK</td><td>5@2</td><td>-</td></tr>
<tr><td>3</td><td>n71</td><td>CC1</td><td>n71</td><td>CC2</td><td>15MHz</td><td>5.0</td><td>10MHz</td><td>CP-OFDM QPSK</td><td colspan="2">Full RB</td><td>DFT-s-OFDM QPSK</td><td>20@19</td><td>-</td></tr>
<tr><td colspan="14">Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2: Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 3: REFSENS_CA_1 refers to the Uplink RB allocation for reference sensitivity exceptions according to table 7.3A.0.2.2-1
Note 4: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration
Note 5: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested
Note 6: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The UL and Reference Measurement Channel is set according to Tables 7.3A.1_1.4.1-1 and 7.3A.1_1.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3A.1_1.4.3.

7.3A.1_1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.1_1.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Tables 7.3A.1_1.4.1-1 and 7.3A.1_1.4.1-2. on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 6.2A.1.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3A.1_1.5-1 and 7.3A.1_1.5-2 for PC3 CA, and in Table 7.3A.1_1.5-1a for PC2 CA. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach P_{UMAX} level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.1_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED and following exception:

For test points with “REFSENS_CA_3” UL configuration in table 7.3A.1_1.4.1-1, message exception in table 7.3A.1_1.4.3-1 applies.

Table 7.3A.1_1.4.3-1: FrequencyInfoUL-SIB

Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB			
Information Element	**Value/remark**	**Comment**	**Condition**
p-Max	20		Power class 3 and Inter-band 2UL CA
	23		Power class 2 and Inter-band 2UL CA

7.3A.1_1.5 Test requirement

For inter-band carrier aggregation the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2 with parameters specified in Table 7.3A.1_1.5-1 for PC3, and in Table 7.3A.1_1.5-1a for PC2. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.3A.1_1.5-1: Reference sensitivity requirement for inter band PC3 CA

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n1A-n3A	all	n1	15	-100+23+TT -100 -2.7 +23+TT[4]												
	1	n3	15	-97+TT --97-2.7+TT[4]												
	2	n3	15							-82.3+1.4 +TT -82.3-2.7+1.4+TT[4]						
CA_n1A-n8A	1	n1	15	-100+6+TT -100 -2.7 +6+TT[4]												
	1	n8	15	-97+TT -97-2.7+TT[4]												
CA_n1A-n77A	all	n1	15				-93.8 +TT -93.8 -2.7+TT[4]									
	1	n77	30													-85.1 +13.8+TT -85.1 -2.2+13.8+TT[4]
	2	n77	15				-92.2 +0.3+TT -92.2 -2.2+0.3+TT[4]									
CA_n1A-n78A	1	n1	15	-100 +8+TT -100 -2.7 +10.7+TT[4]												
	1	n78	15		-95.8 +TT -95.8 -2.2 +TT[4]											
CA_n2A-n48A	1	n48	15				-92.7 +0.3+TT -94.9 +0.3+TT[4]									
	2	n2	15	-98.0 +12+TT -100.7 +12+TT[4]												
CA_n2A-n66A	1	n2	15	-98.0 +20+TT -100.7 +20+TT[4]												

	2	n66	15	-99.5 +4+TT -102.2 +4+TT[4]												
CA_n2A-n77A	1															-85.1 +13.8+TT -87.3 +13.8+TT[4]
	2						-92.2 +0.3+TT -94.4 +0.3+TT[4]									
	3						-91.8 +3.7+TT -94.5+ 3.7+TT[4]									
	4			-98.0 +26+TT -100.7 +28.7+TT[4]												
	5			-98.0 +8+TT -100.7 +10.7+TT[4]												
	6			-98.0 +5+TT -100.7 +5+TT[4]												

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n3A-n77A	All	n3	15						-88.9 +TT -88.9 - 2.7 +TT[4]							
	1	n77	30													-85.1 +13.8 +TT -85.1 -2.2 +13.8 +TT[4]
	2	n77	15		-95.3 +0.3 +TT -95.3 -2.2 +0.3 +TT[4]											
CA_n5A-n66A	1	n5	15	-98.0 +30+TT												
CA_n5A-n77A	1	n77	30													-85.1 +13.8+TT -87.3 +13.8+TT[4]
	2	n77	15				-92.2 +0.3+TT -94.4 +0.3+TT[4]									
	3	n5	15		-94.8 +4.0+TT											
	4	n5	15	-98.0 +8.3+TT												
	5	n5	15	-98.0 +5.5+TT												
CA_n70A-n71A	1	n70	15					-92.7 +4.1 +TT -92.7 - 2.7 +4.1 +TT[4]								
	2	n70	15	-100.0 +9.9 +TT -100.0 -2.7 +9.9 +TT[4]												
	3	n70	15	-100.0 +5 +TT -100.0 -2.7 +5 +TT[4]												
	All	n71	15	-97.2 +TT	-94.0 +TT											

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n3A-n78A	1, 2	n3	15				-90.8 +TT -90.8 -2.7 +TT[4]		-88.9 +TT -88.9 -2.7+ TT[4]							
	1	n78	30													-85.6 +13.8 +TT -85.6 -2.2 +13.8 +TT[4]
	2	n78	15				-92.7 +0.3 +TT -92.7 -2.2 +0.3 +TT[4]									
	3	n3	15	-97.0 +[26] +TT -97.0 -2.7 +[28.7] +TT[4]												
	4	n3	15	-97.0 +[8] +TT -97.0 -2.7 +[10.7] +TT[4]												
	3, 4	n78	15		-95.8 +TT -95.8 -2.2 +TT[4]											

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n5A-n78A	1, 2	n5	15				-86.8 +TT									
	1	n78	30													-85.6 +1.4 +TT -85.6 - 2.2 +1.4 +TT4
	2	n78	15				-92.7 +7.8 +TT -92.7 -2.2 +7.8 +TT4									
CA_n7A-n78A	1	n7	30								-81.5 +4.5 +TT -81.5 -2.7+4.5 +TT[4]					
	1	n78	30													-85.6 +1.4 +TT -85.6 - 2.2 +1.4 +TT[4]
CA_n8A-n78A	1	n8	15				-85.8 + TT									
	1	n78	30													-85.6 +1.4 +TT -85.6 -2.2 +1.4 +TT[4]
	2	n8	15	-97.0 + 8.3 +TT												
	2	n78	15		-95.8 +TT -95.8 -2.2 +TT[4]											
CA_n26A-n66A	1	n26	15	-97.5[5] + 30 +TT												

	1	n66	15	-99.5 +TT													

CA_n26A-n70A	1	n26	15	-97.5[5] + 30 +TT												
	1	n70	15					-92.7 + TT -92.7 - 2.7 +TT[4]								
CA_n29A-n71A	1	n29	15	-97.0 + 17.5 + TT												
	1	n71	15				-86.0 + TT									
	2	n29	15		-93.8 + 16.0 +TT											
	2	n71	15				-86.0 + TT									

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n48A-n66A	1	n48	15	-99.0 + TT												
	1	n66	15	-99.5 + 5.0 + TT -99.5 +5.0 -2.7 +TT												
	2	n48	15		-95.8 + 23.9 + TT											
	2	n66	15	-99.5 +TT -99.5 -2.7 +TT												
	3	n48	30									-96.1 + 8.3 +TT				
	3	n66	15	-99.5 +TT -99.5 -2.7 +TT												
	4	n48	15		-95.8 + 1.1. + TT											
	4	n66	15	-99.5 +TT -99.5 -2.7 +TT												

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n48A-n70A	1	n48	15		-95.8 + TT											
	1	n70	15					-92.7 +26 +TT -92.7 -2.7 +28.4 +TT4								
CA_n66A-n71A	1	n66	15	-99.5 +5 +TT -99.5 -2.7 +5 +TT4												
	1	n71	15	-97.2 +TT												

Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)
Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.
Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.
Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.
Note 5: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.

Table 7.3A.1_1.5-1a: Reference sensitivity requirement for inter band PC2 CA

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n1A-n78A	1	n1	15	-100 +[17.8]+TT												
				-100 -2.7 +[17.8]+TT[4]												
	1	n78	15		-95.8 +TT											
					-95.8 - 2.2 +TT[4]											
Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2) Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2. Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.																

Table 7.3A.1_1.5-2: Reference sensitivity requirement for intraband non-contiguous CA

CA configuration	Test ID	NR band	SCS kHz	Channel Bandwidth												
				5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	70 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)
CA_n71(2A)	1	n71	15	-97.2 +TT for PCC -97.2 + 4.0 +TT for SCC												
	2	n71	15		-94.0 +22.2 +TT	-91.6 +TT										
	3	n71	15		-94.0 +5.2 +TT	-91.6 +TT										

Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)
Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.
Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.

7.3A.2 Reference sensitivity power level for 3DL CA

7.3A.2.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area.

7.3A.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR 3DL CA.

7.3A.2.3 Minimum requirements

The minimum conformance requirements are defined in clause 7.3A.0.

7.3A.2.4 Test description

7.3A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.2A.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.2.4.1-1: Test Configuration Table for 3DL CA

Initial conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	For test frequencies refer to “Range” columns. For Inter-band CA: CA_nXA-nYA-nZA: Mid range for PCC and SCC with exceptions (Note 11): CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA :Low range, High Range for nXC and nXB, mid range for nYA for PCC and SCC with exceptions : CA configurations containing the following band combinations: CA_n1-n77: Mid in band n1 and Low in band n77 CA_n3-n77: TBD in band 3 and TBD in band 77. CA_n3-n78: Mid in band 3 and High in band 78. CA_n8-nX: Low range for PCC in Band 8 CA_n70-n71: High range for PCC in band 71
Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Refer to “N_{RB_PCC}”and “N_{RB_SCC}” columns
Test SCS as specified in Table 5.3.5-1	Lowest
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters for CA Configurations																	
ID	**CA Configuration / channel BW**											**DL Allocation**			**UL allocation (NOTE2.0 to NOTE 5)**		
	CA configuration								**PCC**	**SCC1**	**SCC2**	**CC Mod**	**PCC & SCC RB allocation**		**CC Mod**	**PCC & SCC RB allocation**	
	PCC		**W_{gap1}**	**SCC1**		**W_{gap2}**	**SCC2**						**PCC**	**SCC**			
	Band	**Range**		**Band**	**Range**		**Band**	**Range**									
Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)																	
1	nX	Low CC1	N/A	nX	Low CC2	N/A	nX	Low CC3	Highest N_{RB_agg}	Highest N_{RB_agg}	Highest N_{RB_agg}	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
2	nX	High CC1	N/A	nX	High CC2	N/A	nX	High CC3	Highest N_{RB_agg}	Highest N_{RB_agg}	Highest N_{RB_agg}	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-

Test Parameters for CA Configurations																	
ID	CA Configuration / channel BW											DL Allocation			UL allocation (NOTE2.0 to NOTE 5)		
	CA configuration								PCC	SCC1	SCC2	CC Mod	PCC & SCC RB allocation		CC Mod	PCC & SCC RB allocation	
	PCC		W_{gap1}	SCC1		W_{gap2}	SCC2						PCC	SCC			
	Band	Range		Band	Range		Band	Range									
Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)																	
1	nX	default	N/A	nY	default	N/A	nZ	default	Highest	Highest	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
2	nY	default	N/A	nZ	default	N/A	nX	default	Highest	Highest	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
3	nZ	default	N/A	nY	default	N/A	nX	default	Highest	Highest	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)																	
1	nX	default	N/A	nX	default	N/A	nY	default	Highest N_{RB_agg}	Highest N_{RB_agg}	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
2	nY	default	N/A	nX	default	N/A	nX	default	Highest	Highest N_{RB_agg}	Highest N_{RB_agg}	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-

Test Parameters for CA Configurations																	
ID	CA Configuration / channel BW											DL Allocation			UL allocation (NOTE2.0 to NOTE 5)		
	CA configuration								PCC	SCC1	SCC2	CC Mod	PCC & SCC RB allocation		CC Mod	PCC & SCC RB allocation	
	PCC		W_{gap1}	SCC1		W_{gap2}	SCC2						PCC	SCC			
	Band	Range		Band	Range		Band	Range									
Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)																	
1	nX	CC1	Max (NOTE 7)	nX	CC2	N/A	nY	Mid	Highest N_{RB_agg} (NOTE 6)	Highest N_{RB_agg} (NOTE 6)	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-
2	nY	Mid	NA	nX	CC1	Max (NOTE 7)	nX	CC2	Highest	Highest N_{RB_agg}	Highest N_{RB_agg}	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS	-

Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
Note 2.0: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.
Note 2: Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Note 3: Inter-band: nX,nY,nZ correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, nX=n1, nY=n3, nZ=n8.
Note 4: Intra-band contiguous + Inter-band: nX, nY correspond to the different bands in the CA Configuration, e.g. for CA_n1C-n3A, nX=n1, nY=n3
Note 5: Intra-band non-contiguous + Inter-band: nX and nY correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, nX=n1, nY =n8.
Note 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest N_{RB_PCC} is tested
Note 7: The W_{gap} is defined to be widest possible on band based on the PCC and SCC configuration for Intra-band non-contiguous
Note 8: For band combinations including operating bands without uplink band (as noted in Table 5.2-1), only the CA configurations where PCC band has uplink band shall be tested
Note 9: The fallback configuration CA_nXA-nYA for 3CA configurations CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA does not need to be tested even if the test frequency differs
Note 10: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.
Note 11: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.

Table 7.3A.2.4.1-2: Void

Table 7.3A.2.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and Reference Measurement Channel is set according to Tables 7.3A.2.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3A.2.1.4.3.

7.3A.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.2.1.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1-1 for C_RNTI to transmit the DL RMC according to Tables 7.3A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.3A.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1 and 7.3.2.5-2 as appropriate. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach P_{UMAX} level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.3A.2.5 Test requirement

For 3DL carrier aggregation, test parameters are specified in table 7.3A.2.4.1-1. For the CA configurations listed in table 7.3A.2.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with reference power level specified in table 7.3.2.5-1 for each non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for each non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by $\Delta R_{IB,c}$ defined in clause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

For intra-band non-contiguous CA with one uplink carrier and two or more downlink sub-blocks, the test requirement for SCC(s) shall be increased by ΔR_{IBNC} given in Table 7.3A.0.2.2-1. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.3.1-1) configured.

Table 7.3A.2.5-1: Reference sensitivity requirement for 3DL CA

Carrier aggregation type	DL CA configuration	UL CA configuration
Intra-band contiguous 3DL CA	CA_n77D	-
	CA_n78D	-
Intra-band non-contiguous 3DL CA	CA_n48(3A)	-
Inter-band 3DL CA	CA_n1A-n78C	
	CA_n1A-n78(2A)	-
	CA_n1A-n78A-n79A	-
	CA_n26A-n66-n70A	
	CA_n26A-n66(2A)	
	CA_n48A-n66(2A)	
	CA_n48A-n71(2A)	
	CA_n48B-n66A	
	CA_n48B-n70A	
	CA_n48B-n71A	
	CA_n48(2A)-n66A	
	CA_n48(2A)-n70A	
	CA_n48(2A)-n71A	
	CA_n48A-n66A-n70A	
	CA_n48A-n66A-n71A	
	CA_n48A-n70A-n71A	
	CA_n66A-n70A-n71A	-
	CA_n66A-n71(2A)	
	CA_n66(2A)-n70A	-
	CA_n66(2A)-n71A	-
	CA_n66B-n70A	-
	CA_n66B-n71A	-
	CA_n70A-n71A(2A)	
SDL configuration	CA_n29A-n66A-n70A	-
	CA_n29A-n66B	-
	CA_n29A-n66(2A)	-

7.3A.3 Reference sensitivity power level for 4DL CA

NOTE: Intraband contiguous and 4 band inter-band 4DL CA are FFS

7.3A.3.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area.

7.3A.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 4DL CA.

7.3A.3.3 Minimum requirements

The minimum conformance requirements are defined in clause 7.3A.0.

7.3A.3.4 Test description

7.3A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.3.4.1-1: Test Configuration Table for 4DL CA

Initial conditions	
onment as specified in TS 38.508-1 [5] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH
encies as specified in TS 38.508-1 [5] subclause 4.3.1	For test frequencies refer to "Range" columns. For Inter-band CA: CA_nX(2A)-nYA-nZA: Mid range for PCC and SCC with exceptions. CA_nXC-nYA-nZA and CA_nXB-nYA-nZA : Low range, High Range for nXC and nXI range for nYA for PCC and SCC with exceptions. Exceptions for CA configurations containing the following band combinations: CA_n1-n77: Mid in band n1 and Low in band n77 CA_n3-n77: TBD in band 3 and TBD in band 77. CA_n3-n78: Mid in band 3 and High in band 78. CA_n8-nX: Low range for PCC in Band 8 CA_n70-n71: High range for PCC in band 71
ombination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth n sets supported by the UE.	Refer to "PCC N_{RB}" and "SCC N_{RB}" columns
as specified in Table 5.3.5-1	Lowest
gnalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters for CA Configurations

CA Configuration / channel BW: CA configuration: PCC d	PCC Range	Wgap1	SCC1 Band	SCC1 Range	Wgap2	SCC2 Band	SCC2 Range	Wgap3	SCC3 Band	SCC3 Range	PCC	SCC1	SCC2	SCC3	DL Allocation: CC Mod	DL Allocation: PCC & SCC RB allocation PCC	DL Allocation: PCC & SCC RB allocation SCC	UL allocation (NOTI: CC Mod	UL allocation (NOTI: PCC & SC allocati
Default Test Settings for a CA_nXC-nYA-nZA and CA_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band)																			
	default	N/A	nX	default	N/A	nY	default	N/A	nZ	default	Highest NRB_agg	Highest NRB_agg	Highest	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS
	default	N/A	nX	default	N/A	nX	default	N/A	nZ	default	Highest	Highest NRB_agg	Highest NRB_agg	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS
	default	N/A	nX	default	N/A	nX	default	N/A	nY	default	Highest	Highest NRB_agg	Highest NRB_agg	Highest	CP-OFDM QPSK	Full RB		DFT-s-OFDM QPSK	REFSENS

Test Parameters for CA Configurations																				
CA Configuration / channel BW																DL Allocation			UL allocation (NOT	
CA configuration											PCC	SCC1	SCC2	SCC3	CC Mod	PCC & SCC RB allocation		CC Mod	PCC & SC allocati
PCC		Wgap1	SCC1		Wgap2	SCC2		Wgap3	SCC3							PC C	SC C		
d	Range		Band	Range		Band	Range		Band	Range									

Default Test Settings for a CA_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)																	
CC1	Max (NOTE 7)	nX	CC2	N/A	nY	N/A	N/A	nZ	default	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	Highest	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS
default	N/A	nX	CC1	Max (NOTE 7)	nX	CC2	N/A	nZ	default	Highest	Highest NRB_agg	Highest NRB_agg	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS
default	N/A	nX	CC1	Max (NOTE 7)	nX	CC2	N/A	Ny	default	Highest	Highest NRB_agg	Highest NRB_agg	Highest	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS
Default Test Settings for a CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)																	
CC1	Max (NOTE 7)	nX	CC2	N/A	nY	CC1	Max (NOTE 7)	nY	CC2	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS
CC1	Max (NOTE 7)	nY	CC2	N/A	nX	CC1	Max (NOTE 7)	nX	CC2	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	Highest NRB_agg (NOTE 6)	CP-OFDM QPSK	Full RB	DFT-s-OFDM QPSK	REFSENS

CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.
Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.
Inter-band: X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8.
Intra-band contiguous + Inter-band: X,Y,Z correspond to the different bands in the CA Configuration, e.g. for CA_n1C-n3A-n8A, X=1,Y=3, Z = 8
Intra-band non-contiguous + Inter-band: X, Y and Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A-n28A, X=1, Y =8, Z = 28.
If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested
The Wgap is defined to be widest possible on band based on the PCC and SCC configuration for Intra-band non-contiguous
For band combinations including operating bands without uplink band (as noted in Table 5.2-1), only the CA configurations where PCC band has uplink band shall be tested
The fallback configurations including CA_XA-YA for 4CA configurations XC-YA-ZA and XB-YA-ZA do not need to be tested even if the test frequency differs. 7.3A.1_1 shall be tested for all XA-YA combinations inc
exceptions.
In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The UL and Reference Measurement Channel is set according to Table 7.3A.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3A.2.1.4.3.

7.3A.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.3.1.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1-1 for C_RNTI to transmit the DL RMC according to Table 7.3A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.3A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1 and 7.3.2.5-2 as appropriate. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach P_{UMAX} level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.3A.3.5 Test requirement

For 4DL carrier aggregation, test parameters are specified in table 7.3A.3.4.1-1. For the CA configurations listed in table 7.3A.3.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with reference sensitivity power level specified in table 7.3.2.5-1 for each non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for each non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by $\Delta R_{IB,c}$ defined in clause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

For intra-band non-contiguous CA with one uplink carrier and two or more downlink sub-blocks, the test requirement for SCC(s) shall be increased by ΔR_{IBNC} given in Table 7.3A.0.2.2-1. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.3.1-1) configured.

Table 7.3A.3.5-1: Reference sensitivity requirement for 4DL CA

Carrier aggregation type	DL CA configuration	UL CA configuration
Inter-band 4DL CA	CA_n26A-n66(2A)-n70A	-
	CA_n48A-n66A-n71(2A)	-
	CA_n48A-n66(2A)-n70A	-
	CA_n48A-n66(2A)-n71A	-
	CA_n48A-n70A-n71(2A)	-
	CA_n48B-n66A-n70A	-
	CA_n48B-n66A-n71A	-
	CA_n48B-n70A-n71A	-
	CA_n48(2A)-n66A-n70A	-
	CA_n48(2A)-n66A-n71A	-
	CA_n48(2A)-n66(2A)	-
	CA_n48(2A)-n70A-n71A	-
	CA_n48(2A)-n71(2A)	-
	CA_n66A-n70A-n71(2A)	-
	CA_n66B-n70A-n71A	-
	CA_n66(2A)-n70A-n71A	-
	CA_n66(2A)-n71(2A)	-
SDL configuration	CA_n29A-n66B-n70A	-
	CA_n29A-n66(2A)-n70	-

7.3A.4 Reference sensitivity power level for 5DL CA

FFS

7.3B Reference sensitivity for NR-DC

For inter-band NR-DC configurations, the reference sensitivity for the corresponding inter-band CA configuration as specified in clause 7.3A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.3A.

7.3C Reference sensitivity for SUL

7.3C.0 Minimum conformance requirements

7.3C.0.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3C.0.2 Minimum conformance requirements for Reference sensitivity power level

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in Table 7.3.2.3-1 and 7.3.2.3-2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-1 or supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.0.2-1 with reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1), unless sensitivity degradation is allowed in this section of this specification. These exceptions also apply to any higher order CA or DC combination containing one of the exception combinations in this section as subset.

For SUL operation with downlink CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.2-3 or supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.2-1 with reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1), unless sensitivity degradation is allowed in this clause of this specification. These exceptions also apply to any higher order CA or DC combination containing one of the exception combinations in this clause as subset.

Table 7.3C.0.2-1: Supplementary uplink configuration for reference sensitivity

DL band	UL band	SCS of UL band (kHz)	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHZ	80 MHz	90 MHz	100 MHz
n41	n83	15		100	100	100		100	100	100	100		100	100	100
		30		50	50	50		50	50	50	50		50	50	50
n78	n80	15	25	50	75	100			100	100					
n78	n81	15	25	50	75	100			100	100					
n78	n82	15	25	50	75	100			100	100					
n78	n83	15	25	50	75	100			100	100					
n78	n84	15	25	50	75	100	100	100	100	100		100			
n78	n86	15	25	50	75	100			100	100					
n79	n80	15	25	50	75	100			100	100					
n79	n81	15	25	50	75	100			100	100					
n79	n83	15							100	100	100		100		100
		30							50	50	50		50		50

For the UE that supports any of the SUL operation given in Table 7.3C.0.2-2, exceptions to the requirements specified in Table7.3.2.3-1 are allowed when the uplink is active in a lower frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3C.0.2-2. For these exceptions, the UE shall meet the requirements specified in Table 7.3C.0.2-2 and Supplementary Uplink configuration (exceptions due to harmonic issue given in Table 7.3C.0.2-3.

Table 7.3C.0.2-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

NR Band / Channel bandwidth of the high band													
UL band	DL band	5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
		dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
n80	n78[1,2]		23.9	22.1	20.9			17.9	16.8	16.0	14.8	14.3	13.8
	n78[3]		1.1	0.8	0.3			0	0	0	0	0	0
n82	n78[4,5]		10.8	9.1	8			6	4.0	3.2	2.0	1.5	1.0
n81	n78[4,5]		10.8	9.1	8			5.1	4.2	3.5	2.3	1.5	1.4
n83	n78[6,7]		10.4	8.9	7.8			4.7	3.7	3	1.7	1.2	0.7
n86	n78[1,2]		23.9	22.1	20.9			17.9	16.8	16.0	14.8	14.3	13.8
	n78[3]		1.1	0.8	0.3				0	0	0	0	0
n81	n79[6,7]							[6.8]	6.2	[5.6]	4.9		4.4

NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ΔF_{HD} above and below the edge of this downlink transmission bandwidth. The value ΔF_{HD} depends on the band combination: ΔF_{HD} = 10 MHz for SUL_n78-n80, SUL_n78-n86.

NOTE 2: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.2 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 3: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at $\pm(20 + BW_{Channel}^{HB} / 2)$ MHz offset from $2 f_{UL}^{LB}$ in the victim (higher band) with $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ and $BW_{Channel}^{HB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.

NOTE 4: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.

NOTE 5: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.4 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 6: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 5th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.

NOTE 7: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \lfloor f_{DL}^{HB} / 0.5 \rfloor 0.1$ in MHz and $F_{UL\_low}^{LB} + BW_{Channel}^{LB} / 2 \le f_{UL}^{LB} \le F_{UL\_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

Table 7.3C.0.2-3: Supplementary uplink configuration (exceptions due to harmonic issue)

NR Band / Channel bandwidth of the high band													
UL band	**DL band**	**5 MHz (N_{RB})**	**10 MHz (N_{RB})**	**15 MHz (N_{RB})**	**20 MHz (N_{RB})**	**25 MHz (N_{RB})**	**30 MHz (N_{RB})**	**40 MHz (N_{RB})**	**50 MHz (N_{RB})**	**60 MHz (N_{RB})**	**80 MHz (N_{RB})**	**90 MHz (N_{RB})**	**100 MHz (N_{RB})**
n80	n78		25	36	50			50	50	50	50	50	50
n81	n78		16	25	25			25	25	25	25	25	25
n81	n79							25	25	25	25		25
n82	n78		16	20	20			20	20	20	20	20	20
n83	n78		10	15	20			25	25	25	25	25	25
n86	n78		25	36	50			100	100	100	100	100	100
NOTE 1: 15kHz SCS is assumed for UL band. NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.2.3-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2.3-3 applies. NOTE 3: Unless stated otherwise, UL resource blocks shall be centred within the transmission bandwidth configuration for the channel bandwidth.													

7.3C.0.3 ΔRIB,c for SUL

7.3C.0.3.1 General

For a UE supporting a SUL configuration, the $\Delta R_{IB,c}$ applies for both SC and SUL operation.

7.3C.0.3.2 SUL band combination

For the UE which supports SUL band combination, the minimum requirement for reference sensitivity in subclause 7.3C.0 shall be increased by the amount given in $\Delta R_{IB,c}$ defined in subclause 7.3C.0.3 for the applicable operating bands. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the average value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum $\Delta R_{IB,c}$ among the different supported band combinations involving such band shall be applied

- When the operating band frequency range is > 1 GHz, the applicable additional $\Delta R_{IB,c}$ shall be the maximum value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14] for the applicable operating bands.

7.3C.0.3.2.1 ΔRIB,c for two bands

Table 7.3C.0.3.2.1-1: $\Delta R_{IB,c}$ due to SUL (two bands)

Band combination for SUL	NR Band	$\Delta R_{IB,c}$ [dB]
SUL_n78-n80	**n78**	**0.5**
SUL_n78-n81	**n78**	**0.5**
SUL_n78-n82	n78	0.5
SUL_n78-n83	n78	0.5
SUL_n78-n84	n78	0.5
SUL_n78-n86	n78	0.5
SUL_n79-n83	n79	0.5

7.3C.0.3.2.2 ΔRIB,c for three bands

Table 7.3C.0.3.2.2-1: $\Delta R_{IB,c}$ due to SUL (three bands)

Band combination for SUL	NR Band	$\Delta R_{IB,c}$ (dB)
CA_n1_SUL_n78-n80	n1	0.2
	n78	0.5
CA_n1_SUL_n78-n84	n1	0.2
	n78	0.5
CA_n3_SUL_n78-n80	n3	0.2
	n78	0.5
CA_n28_SUL_n41-n83	n28	0.2
CA_n28_SUL_n79-n83	n28	0.2
	n79	0.5

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3C.2 and 7.3C.3.

7.3C.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3C.2 Reference sensitivity power level for SUL

Editor's Note: The following aspects are either missing or not yet determined:

- Exceptional test points for configurations except SUL_n78-n80 is FFS

7.3C.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under SUL operation and conditions of low signal level, ideal propagation and no added noise.

7.3C.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports SUL operation on the SUL bands.

7.3C.2.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 7.3C.0.

7.3C.2.4 Test description

7.3C.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3C.2.4.1-1 and 7.3C.2.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3C.2.4.1-1: Test Configuration Table for SUL without exceptions

Initial Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal, TL/VL, TL/VH, TH/VL, TH/VH		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Mid range for SUL carrier. Low, Mid, High range for non-SUL carrier With following exceptions: SUL_n78-n80: High in band n78		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1			Lowest, Mid, Highest for Non-SUL carrier For SUL band: n80: 30 MHz n81: 20 MHz n82: 20 MHz n83: 20 MHz n84: 20 MHz n86: 40 MHz n95: 15 MHz		
Test SCS as specified in Table 5.5C-1			15kHz for SUL carrier Lowest for Non-SUL carrier		
Test Parameters					
Test ID	**Downlink Configuration**		**UL Configuration**	**SUL Configuration**	
	Modulation	**RB allocation**		Modulation	RB allocation (NOTE 2)
1	CP-OFDM QPSK	Full RB (NOTE 1)	N/A	DFT-s-OFDM QPSK	REFSENS (NOTE 2)
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to Table 7.3C.2.4.1-1a which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band. NOTE 3: In a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated.					

Table 7.3C.2.4.1-1a: SUL configuration for reference sensitivity, LCRB @ RBstart format (without exception)

NR Band / SCS of SUL band / Channel bandwidth of the DL band / L_{CRB}@RB_{Start} of SUL band														
DL band	**SUL band**	**SCS of SUL band (kHz)**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**	**90 MHz**	**100 MHz**
n41	n80	15		160@0	160@0	160@0			160@0	160@0	160@0	160@0	160@0	160@0
n41	n81	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n41	n83	15		100@0	100@0	100@0		100@0	100@0	100@0	100@0	100@0	100@0	100@0
		30		50@0	50@0	50@0		50@0	50@0	50@0	50@0	50@0	50@0	50@0
n41	n95	15		75@0	75@0	75@0		75@0	75@0	75@0	75@0	75@0	75@0	75@0
n77	n80	15		160@0	160@0	160@0			160@0	160@0	160@0	160@0	160@0	160@0
n77	n84	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n78	n80	15		160@0	160@0	160@0			160@0	160@0	160@0	160@0	160@0	160@0
n78	n81	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n78	n82	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n78	n83	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n78	n84	15		100@0	100@0	100@0			100@0	100@0	100@0	100@0	100@0	100@0
n78	n86	15		216@0	216@0	216@0			216@0	216@0	216@0	216@0	216@0	216@0
n79	n83	15							100@0	100@0	100@0	100@0		100@0
		30							50@0	50@0	50@0	50@0		50@0
n79	n80	15							160@0	160@0	160@0	160@0		160@0
n79	n81	15							100@0	100@0	100@0	100@0		100@0
n79	n84	15							100@0	100@0	100@0	100@0		100@0
n79	n95	15							75@0	75@0	75@0	75@0		75@0

Table 7.3C.2.4.1-2: Test configurations table for SUL operation exceptions due to UL harmonic issue

Initial Conditions											
Test Environment as specified in TS 38.508-1 [5] subclause 4.1						Normal, TL/VL, TL/VH, TH/VL, TH/VH					
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1						See range column for each CC					
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1						See CBW column for each CC					
Test SCS as specified in Table 5.5C-1						15kHz for SUL carrier Lowest for Non-SUL carrier					
Test Parameters											
ID	**Downlink Configuration**					**UL Configuration**	**SUL Configuration**				
	Band	**Range**	**CBW**	**Mod**	**RB alloc (NOTE 1)**		**Band**	**Range**	**CBW**	**Mod**	**RB alloc (NOTE 2)**
Test settings for SUL_n78-n80											
1	n78	3560	Highest	CP-OFDM QPSK	Full RB	N/A	n80	High	10 MHz	DFT-s-OFDM QPSK	REFSENS_SUL
2	n78	3530	20 MHz	CP-OFDM QPSK	Full RB	N/A	n80	High	10 MHz	DFT-s-OFDM QPSK	REFSENS_SUL
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS_SUL refers to the Uplink RB allocation for reference sensitivity exceptions due to UL harmonic interference according to table 7.3C.0.2-3.											

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1, C.2, C3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.0 with consideration of supplementary uplink physical channels.

4. The UL and DL Reference Measurement Channel shall be set according to Table 7.3C.2.4.1-1 or 7.3C.2.4.1-2.

5. The UL Reference Measurement Channel shall be set according to Table 7.3C.2.4.1-1for REFSENS without exceptions and Table 7.3C.2.4.1-2 when testing is performed with SUL/DL band combination listed in Table 7.3C.0.2-2 for exceptions due to harmonic issue.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause *4.5*. Message contents are defined in clause 7.3C.2.4.3

7.3C.2.4.2 Test procedure

1 SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.3C.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC on SUL band according to Tables 7.3C.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3C.2.5-1 for 2Rx and table 7.3C.2.5-2 for 4Rx. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

5. For configurations listed in table 7.3C.2.4.1-2, repeat step 1-4 with table 7.3C.2.4.1-2 replacing table 7.3C.2.4.1-1 in step1 and step 2, table 7.3C.2.5.1-1 replacing 7.3C.2.5-1 and table 7.3C.2.5-2 in step 3.

7.3C.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH_PUCCH_ON_SUL, additionally the following exception shown in Table 7.3C.2.4.3-1 is considered.

Table 7.3C.2.4.3-1: *PUSCH-Config*

Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED

7.3C.2.5 Test requirement

The throughput measured in step 4 shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 for REFSENS without exception testing with receive power level specified in Tables 7.3C.2.5-1 for 2Rx antenna port and Tables 7.3C.2.5-2 for 4 Rx antenna port, and parameters specified in table 7.3C.2.4.1-1.

Table 7.3C.2.5-0: Test Tolerance (TT) for RX sensitivity level

f ≤ 3.0GHz	3.0GHz < f ≤ 6.0 GHz
0.7 dB	1.0 dB

Table 7.3C.2.5-1: Reference sensitivity QPSK $P_{REFSENS}$ for 2Rx

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n1	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT	-91.9 +TT	-90.6 +TT	-89.6 +TT					FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT	-92.0 +TT	-90.7 +TT	-89.7 +TT					
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT	-92.1 +TT	-90.9 +TT	-89.7 +TT					
n2	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT									FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT									
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT									
n3	15	-97.0 +TT	-93.8 +TT	-92.0 +TT	-90.8 +TT	-89.7 +TT	-88.9 +TT	-87.6 +TT						FDD
	30		-94.1 +TT	-92.1 +TT	-91.0 +TT	-89.8 +TT	-89.0 +TT	-87.7 +TT						
	60		-94.5 +TT	-92.4 +TT	-91.2 +TT	-90.0 +TT	-89.1 +TT	-87.9 +TT						
n5	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-90.8 +TT									FDD
	30		-95.1 +TT	-93.1 +TT	-91.0 +TT									
	60													
n7[1]	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT									FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT									
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT									
n8	15	-97.0 +TT	-93.8 +TT	-92.0 +TT	-90.0 +TT									FDD
	30		-94.1 +TT	-92.1 +TT	-90.2 +TT									
	60													

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n12	15	-97.0 +TT	-93.8 +TT	-84.0 +TT										FDD
	30		-94.1 +TT	-84.1 +TT										
	60													
n14	15	-97.0 +TT	-93.8 +TT											FDD
	30		-94.1 +TT											
	60													
n20	15	-97.0 +TT	-93.8 +TT	-91.0 +TT	-89.8 +TT									FDD
	30		-94.1 +TT	-91.1 +TT	-90.0 +TT									
	60													
n25	15	-96.5 +TT	-93.3 +TT	-91.5 +TT	-90.3 +TT									FDD
	30		-93.6 +TT	-91.6 +TT	-90.5 +TT									
	60		-94.0 +TT	-91.9 +TT	-90.7 +TT									
n26	15	-97.5 +TT	-94.5 +TT	-92.7 +TT	-87.6 +TT									
	30		-94.8 +TT	-92.7 +TT	-87.7 +TT									
n28	15	-98.5 +TT	-95.5 +TT	-93.5 +TT	-90.8 +TT		-78.5 +TT							FDD
	30		-95.6 +TT	-93.6 +TT	-91.0 +TT		-78.6 +TT							
	60													
n30	15	-99.0 +TT	-95.8 +TT											FDD
	30		-96.1 +TT											
	60													

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n34	15	-100.0 +TT	-96.8 +TT	-95.0 +TT										TDD
	30		-97.1 +TT	-95.1 +TT										
	60		-97.5 +TT	-95.4 +TT										
n38	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT			-90.6 +TT						TDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT			-90.7 +TT						
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT			-90.9 +TT						
n39	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT	-91.9 +TT	-90.6 +TT						TDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT	-92.0 +TT	-90.7 +TT						
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT	-92.1 +TT	-90.9 +TT						
n40	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT	-91.9 +TT	-90.6 +TT	-89.6 +TT					TDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT	-92.0 +TT	-90.7 +TT	-89.7 +TT	-88.9 +TT	-87.6 +TT			
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT	-92.1 +TT	-90.9 +TT	-89.8 +TT	-89.1 +TT	-87.6 +TT			
n41[1]	15		-94.8 +TT	-93.0 +TT	-91.8 +TT		-89.9 +TT	-88.6 +TT	-87.6 +TT					TDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT		-90.0 +TT	-88.7 +TT	-87.7 +TT	-86.9 +TT	-85.6 +TT	-85.1 +TT	-84.7 +TT	
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT		-90.1 +TT	-88.9 +TT	-87.8 +TT	-87.1 +TT	-85.6 +TT	-85.1 +TT	-84.7 +TT	
n48[1]	15	-99.0 +TT	-95.8 +TT	-94.0 +TT	-92.7 +TT			-89.6 +TT	-88.6[5] +TT					TDD
	30		-96.1 +TT	-94.1 +TT	-92.9 +TT			-89.7 +TT	-88.7[5] +TT	-87.9[5] +TT	-86.6[5] +TT	-86.1[5] +TT	-85.6[5] +TT	

	60		-96.5 +TT	-94.4 +TT	-93.1 +TT			-89.9 +TT	-88.8[5] +TT	-88.0[5] +TT	-86.7[5] +TT	-86.2[5] +TT	-85.7[5] +TT	

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n50	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT		-91.9 +TT	-90.6 +TT	-89.6 +TT					TDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT		-92.0 +TT	-90.7 +TT	-89.7 +TT	-88.9 +TT	-87.6 +TT			
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT		-92.1 +TT	-90.9 +TT	-89.8 +TT	-89.1 +TT	-87.6 +TT			
n51	15	-100.0 +TT												TDD
	30													
	60													
n53	15	-100.0 +TT	-96.8 +TT											TDD
	30		-97.1 +TT											
	60		-97.5 +TT											
n65	15	-99.5+TT	-96.3+TT	-94.5+TT	-93.3+TT									FDD
	30		-96.6+TT	-94.6+TT	-93.5+TT									
	60		-97.0+TT	-94.9+TT	-93.7+TT									
n66	15	-99.5 +TT	-96.3 +TT	-94.5 +TT	-93.3 +TT	-92.2 +TT	-91.4 +TT	-90.1 +TT						FDD
	30		-96.6 +TT	-94.6 +TT	-93.5 +TT	-92.3 +TT	-91.5 +TT	-90.2 +TT						
	60		-97.0 +TT	-94.9 +TT	-93.7 +TT	-92.5 +TT	-91.6 +TT	-90.4 +TT						
n70	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	-92.7 +TT								FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	-92.8 +TT								
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	-93.0 +TT								

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n71	15	-97.2 +TT	-94.0 +TT	-91.6 +TT	-86.0 +TT									FDD
	30		-94.3 +TT	-91.9 +TT	-87.4 +TT									
	60	-												
n74	15	-99.5[3] +TT	-96.3[3] +TT	-94.5[3] +TT	-93.3[3] +TT									FDD
	30		-96.6[3] +TT	-94.6[3] +TT	-93.5[3] +TT									
	60		-97.0[3] +TT	-94.9[3] +TT	-93.7[3] +TT									
n77[1,4]	15		-95.3 +TT	-93.5 +TT	-92.2 +TT			-89.1 +TT	-88.1 +TT					TDD
	30		-95.6 +TT	-93.6 +TT	-92.4 +TT			-89.2 +TT	-88.2 +TT	-87.4 +TT	-86.1 +TT	-85.6 +TT	-85.1 +TT	
	60	-	-96.0 +TT	-93.9 +TT	-92.6 +TT			-89.4 +TT	-88.3 +TT	-87.5 +TT	-86.2 +TT	-85.7 +TT	-85.2 +TT	
n78[1]	15		-95.8 +TT	-94.0 +TT	-92.7 +TT			-89.6 +TT	-88.6 +TT					TDD
	30		-96.1 +TT	-94.1 +TT	-92.9 +TT			-89.7 +TT	-88.7 +TT	-87.9 +TT	-86.6 +TT	-86.1 +TT	-85.6 +TT	
	60		-96.5 +TT	-94.4 +TT	-93.1 +TT			-89.9 +TT	-88.8 +TT	-88.0 +TT	-86.7 +TT	-86.2 +TT	-85.7 +TT	
n79[1]	15							-89.6 +TT	-88.6 +TT					TDD
	30							-89.7 +TT	-88.7 +TT	-87.9 +TT	-86.6 +TT		-85.6 +TT	
	60							-89.9 +TT	-88.8 +TT	-88.0 +TT	-86.7 +TT		-85.7 +TT	

NOTE 1:	Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.
NOTE 2:	The transmitter shall be set to P_{UMAX} as defined in subclause 6.2C.1
NOTE 3:	[3] indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.
NOTE 4:	The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5:	For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.
NOTE 6:	TT for each frequency and channel bandwidth is specified in Table 7.3C.2.5-0.

Table 7.3C.2.5-2: Reference sensitivity QPSK $P_{REFSENS}$ for Four Rx antenna ports

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n1	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT	-94.6 +TT	-93.3 +TT	-92.3 +TT					FDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT	-94.7 +TT	-93.4 +TT	-92.4 +TT					
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT	-94.8 +TT	-93.6 +TT	-92.4 +TT					
n2	15	-100.7 +TT	-97.5 +TT	-95.7 +TT	-94.5 +TT									FDD
	30		-97.8 +TT	-95.8 +TT	-94.7 +TT									
	60		-98.2 +TT	-96.1 +TT	-94.9 +TT									
n3	15	-99.7 +TT	-96.5 +TT	-94.7 +TT	-93.5 +TT	-92.4 +TT	-91.6 +TT	-90.3 +TT						FDD
	30		-96.8 +TT	-94.8 +TT	-93.7 +TT	-92.5 +TT	-91.7 +TT	-90.4 +TT						
	60		-97.2 +TT	-95.1 +TT	-93.9 +TT	-92.7 +TT	-91.8 +TT	-90.6 +TT						
n7	15	-100.7 +TT	-97.5 +TT	-95.7 +TT	-94.5 +TT									FDD
	30		-97.8 +TT	-95.8 +TT	-94.7 +TT									
	60		-98.2 +TT	-97.1 +TT	-94.9 +TT									
n30	15	-101.7 +TT	-98.5 +TT											FDD
	30		-98.8 +TT											
	60													
n34	15	-102.7 +TT	-99.5 +TT	-97.7 +TT										TDD
	30		-99.8 +TT	-97.8 +TT										
	60		-100.2 +TT	-98.1 +TT										

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**25 MHz (dBm)**	**30 MHz (dBm)**	**40 MHz (dBm)**	**50 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**90 MHz (dBm)**	**100 MHz (dBm)**	**Duplex Mode**
n38	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT			-93.3 +TT						TDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT			-93.4 +TT						
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT			-93.6 +TT						
n39	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT	-94.6 +TT	-93.3 +TT						TDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT	-94.7 +TT	-93.4 +TT						
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT	-94.8 +TT	-93.6 +TT						
n40	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT	-94.6 +TT	-93.3 +TT	-92.3 +TT					TDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT	-94.7 +TT	-93.4 +TT	-92.4 +TT	-91.6 +TT	-90.3 +TT			
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT	-94.8 +TT	-93.6 +TT	-92.5 +TT	-91.8 +TT	-90.3 +TT			
n41	15		-97.5 +TT	-95.7 +TT	-94.5 +TT		-92.6 +TT	-91.3 +TT	-90.3 +TT					TDD
	30		-97.8 +TT	-95.8 +TT	-94.7 +TT		-92.7 +TT	-91.4 +TT	-90.4 +TT	-89.6 +TT	-88.3 +TT	-87.8 +TT	-87.4 +TT	
	60		-98.2 +TT	-96.1 +TT	-94.9 +TT		-92.8 +TT	-91.6 +TT	-90.5 +TT	-89.8 +TT	-88.3 +TT	-87.8 +TT	-87.4 +TT	
n48	15	-101.2 +TT	-98.0 +TT	-96.2 +TT	-94.9 +TT			-91.8 +TT	-90.8[3] +TT					TDD
	30		-98.3 +TT	-96.3 +TT	-95.1 +TT			-91.9 +TT	-90.9[3] +TT	-90.1[3] +TT	-88.8[3] +TT	-88.3[3] +TT	-87.8[3] +TT	
	60		-98.7 +TT	-96.6 +TT	-95.3 +TT			-92.1 +TT	-91.0[3] +TT	-90.2[3] +TT	-88.9[3] +TT	-88.4[3] +TT	-87.9[3] +TT	
n66	15	-102.2 +TT	-99.0 +TT	-97.2 +TT	-96.0 +TT	-94.9 +TT	-94.1 +TT	-92.8 +TT						FDD
	30		-99.3 +TT	-97.3 +TT	-96.2 +TT	-95.0 +TT	-94.2 +TT	-92.9 +TT						
	60		-99.7 +TT	-97.6 +TT	-96.4 +TT	-95.2 +TT	-94.3 +TT	-93.1 +TT						

Operating band / SCS / Channel bandwidth / Duplex-mode														
Operating Band	SCS kHz	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	25 MHz (dBm)	30 MHz (dBm)	40 MHz (dBm)	50 MHz (dBm)	60 MHz (dBm)	80 MHz (dBm)	90 MHz (dBm)	100 MHz (dBm)	Duplex Mode
n70	15	-102.7 +TT	-99.5 +TT	-97.7 +TT	-96.5 +TT	-95.4 +TT								FDD
	30		-99.8 +TT	-97.8 +TT	-96.7 +TT	-95.5 +TT								
	60		-100.2 +TT	-98.1 +TT	-96.9 +TT	-95.7 +TT								
n77[4]	15		-97.5 +TT	-95.7 +TT	-94.4 +TT			-91.3 +TT	-90.3 +TT					TDD
	30		-97.8 +TT	-95.8 +TT	-94.6 +TT			-91.4 +TT	-90.4 +TT	-89.6 +TT	-88.3 +TT	-87.8 +TT	-87.3 +TT	
	60	-	-98.2 +TT	-96.1 +TT	-94.8 +TT			-91.6 +TT	-90.5 +TT	-89.7 +TT	-88.4 +TT	-87.9 +TT	-87.4 +TT	
n78	15		-98.0 +TT	-96.2 +TT	-94.9 +TT			-91.8 +TT	-90.8 +TT					TDD
	30		-98.3 +TT	-96.3 +TT	-95.1 +TT			-91.9 +TT	-90.9 +TT	-90.1 +TT	-88.8 +TT	-88.3 +TT	-87.8 +TT	
	60		-98.7 +TT	-96.6 +TT	-95.3 +TT			-92.1 +TT	-91.0 +TT	-90.2 +TT	-88.9 +TT	-88.4 +TT	-87.9 +TT	
n79	15							-91.8 +TT	-90.8 +TT					TDD
	30							-91.9 +TT	-90.9 +TT	-90.1 +TT	-88.8 +TT		-87.8 +TT	
	60							-92.1 +TT	-91.0 +TT	-90.2 +TT	-88.9 +TT		-87.9 +TT	
NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE. NOTE 2 The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz. NOTE 3: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration. NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3C.2.5-0. NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.														

For the UE that supports any of the SUL operation given in Table 7.3C.0.2-2, exceptions to the requirements specified in Table 7.3C.2.5-1 or Table 7.3C.2.5-2 are allowed when the uplink is active in a lower frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3C.0.2-2. For these exceptions, the UE shall meet the requirements specified in clause 7.3C.2.5.1.

7.3C.2.5.1 Reference sensitivity exceptions due to harmonic issue

For SUL operation with DL band listed in Table 7.3C.0.2.3-2 with supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.0.2.3-1, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in Table 7.3C.2.5.1-1 due to harmonic exceptions.

Table 7.3C.2.5.1-1: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

SUL band	DL band	Test ID	SCS	Downlink Channel Bandwidth / REFSENS requirement											
				5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100
			kHz	dBm	dBm	dBm	dBm	dBm	dBm	dBm	dBm	dBm	dBm	dBm	dE
n80	n78[1]	1	30												-85 +1 +T -85.6 +1 +T
		2	15				-92.7 +0.3 +TT -92.7 -2.2 +0.3 +TT[3]								
NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. NOTE 2: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2C.1 NOTE 3: Applicable only if operation with 4 antenna ports is supported in the band with SUL configured															

Table 7.3C.2.5.1-2: Void

For the UE which supports SUL band combination, the test requirement for reference sensitivity in Tables 7.3C.2.5-1, 7.3C.2.5-2 and 7.3C.2.5.1-1, 7.3C.2.3-1 shall be increased by the amount given in $\Delta R_{IB,c}$ defined in subclause 7.3C.0.3.

7.3C.3 Reference sensitivity power level for SUL (3CC)

Editor's Note:

- No test points defined for Reference sensitivity power level testing for SUL with DL CA. This test case is covered by 7.3.2 and 7.3C.2.

7.3C.3.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under SUL and 2 DL CA operation and conditions of low signal level, ideal propagation and no added noise.

7.3C.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports SUL operation on the SUL bands with 2DL CA.

7.3C.3.3 Minimum conformance requirement

The minimum conformance requirements are defined in clause 7.3C.0.

7.3C.3.4 Test description

NOTE: No testing needs to be performed since the testing has been covered in test case 7.3.2 and 7.3C.2.

For band combination CA_nX_SUL_nY-nZ, test the REFSENS of SUL configuration or NR band as listed in table 7.3C.3.4-1.

Table 7.3C.3.4-1: Test band combinations and configuration

Band configuration	Verifying REFSENS of SUL configurations/ NR band	Subtest case	Table with test parameters to select
CA_n1A_SUL_n78A-n80A	SUL_n78A-n80A	7.3C.2	Table 7.3C.2.4.1-1
	n1	7.3.2	Table 7.3.2.4.1-1
CA_n1A_SUL_n78A-n84A	SUL_n78A-n84A	7.3C.2	Table 7.3C.2.4.1-1
	n1	7.3.2	Table 7.3.2.4.1-1
CA_n3A_SUL_n78A-n80A	SUL_n78A-n80A	7.3C.2	Table 7.3C.2.4.1-1
	n3	7.3.2	Table 7.3.2.4.1-1
CA_n28A_SUL_n41A-n83A	SUL_n41A-n83A	7.3C.2	Table 7.3C.2.4.1-1
	n28	7.3.2	Table 7.3.2.4.1-1
SUL_n79C-n83A	SUL_n79A-n83A	7.3C.2	Table 7.3C.2.4.1-1
CA_n28A_SUL_n79A-n83A	SUL_n79A-n83A	7.3C.2	Table 7.3C.2.4.1-1
	n28	7.3.2	Table 7.3.2.4.1-1

7.3C.3.5 Test requirement

Same test requirement as clause 7.3.2 and 7.3C.2 for each band or band combinations listed in table 7.3C.3.4-1.

7.3D Reference sensitivity for UL MIMO

7.3D.1 General

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter P_{UMAX} is the total transmitter power over the two transmits power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D

7.3D.2 Reference sensitivity power level for UL MIMO

7.3D.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.3D.2.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter P_{UMAX} is the total transmitter power over the two transmits power over the two transmit antenna connectors

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D and 7.3.

7.3D.2.4 Test description

7.3D.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3D.2.4.1-1, Table 7.3D.2.4.1-2, and Table 7.3D.2.4.1-3. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3D.2.4.1-1: Test Configuration Table

Initial Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal, TL/VL, TL/VH, TH/VL, TH/VH	
Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1			Low range, Mid range, High range	
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1			Lowest, Mid, Highest	
Test SCS as specified in Table 5.3.5-1			Lowest	
Test Parameters				
Test ID	**Downlink Configuration**		**Uplink Configuration**	
	Modulation	**RB allocation**	**Modulation**	**RB allocation**
1	CP-OFDM QPSK	Full RB (NOTE 1)	CP-OFDM QPSK	REFSENS (NOTE 2)
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to Table 7.3.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and DL Reference Measurement Channel is set according to Table 7.3D.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3D.2.4.3.

7.3D.2.4.2 Test procedure

Same test procedure as specified in 7.3.2.4.2 with the following exception:

Step 2: SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.3D.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0_1 is specified with condition 2TX_UL_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

7.3D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO and exceptions listed in clause 7.3.2.4.3

7.3D.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3.2.5-1 and parameters specified Tables 7.3D.2.4.1-1, Tables 7.3.2.4.1-2 and Tables 7.3.2.4.1-3.

7.3E Reference sensitivity for V2X

7.3E.1 General

The reference sensitivity power level $P_{REFSENS\_V2X}$ is the minimum mean power applied to each one of the UE antenna ports for V2X UE, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3E.2 Reference sensitivity for V2X / non-concurrent operation

Editor's Note: The following aspects are not yet determined:

- TP analysis is FFS

7.3E.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive V2X physical channel data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3E.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication.

7.3E.2.3 Minimum conformance requirements

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.3E.2.3-1.

Table 7.3E.2.3-1: Reference sensitivity of NR V2X Bands (PC5)

		Channel bandwidth / $P_{REFSENS\_V2X}$(dBm)				
NR V2X Band	**SCS kHz**	**10 MHz**	**20 MHz**	**30 MHz**	**40 MHz**	**Duplex Mode**
n38	15	-96.5	-93.2	-91.4	-90.1	HD
	30	-96.1	-93.4	-91.7	-90.2	HD
	60	-96.9	-93.1	-91.9	-90.4	HD
n47	15	-92.5	-89.2	-87.4	-86.1	HD
	30	-92.1	-89.4	-87.7	-86.2	HD
	60	-92.9	-89.1	-87.9	-86.4	HD
NOTE 1: Reference measurement channel is defined in A.7.2. NOTE 2: The signal power is specified per antenna port. NOTE 3: Void.						

Table 7.3E.2.3-2: Sidelink TX configuration for reference sensitivity of NR V2X Bands (PC5)

NR Band / SCS / Channel bandwidth / Duplex mode						
NR V2X Band	**SCS kHz**	**10 MHz**	**20 MHz**	**30 MHz**	**40 MHz**	**Duplex Mode**
n38	**15**	**50**	**105**	**160**	**216**	**HD**
	30	**24**	**50**	**75**	**105**	**HD**
	60	**10[2]**	**24**	**36**	**50**	**HD**
n47	15	50	105	160	216	HD
	30	24	50	75	105	HD
	60	10[2]	24	36	50	HD
NOTE 1: The sidelink allocated RB (L_{CRB}) size could be adjusted according to resource pool configuration in [6]. NOTE 2: For the case, 11 RB is allowed for S-SS/PSBCH Block.						

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3E.2.

7.3E.2.4 Test description

7.3E.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3E.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexe A.7.2 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 7.3E.2.4.1-1: Test Configuration Table

Initial Conditions		
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		[Normal, TL/VL, TL/VH, TH/VL, TH/VH]
Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1		[Mid range]
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		[Lowest, Highest]
Test SCS as specified in Table 5.3.5-1		[Lowest]
Test Parameters		
Test ID	**V2X Configuration to receive**	
	Modulation	**RB allocation**
1	[CP-OFDM QPSK]	[Full RB (NOTE 1)]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3E.2.4.1-2.		

Table 7.3E.2.4.1-2: PSSCH Configuration for REFSENS

Channel Bandwidth	SCS(kHz)	LCRBmax	Outer RB allocation / Normal RB allocation
10MHz	15	52	50@0
	30	24	24@0
	60	11	10@0
20MHz	15	106	105@0
	30	51	50@0
	60	24	24@0
30MHz	15	160	160@0
	30	78	75@0
	60	38	36@0
40MHz	15	216	216@0
	30	106	105@0
	60	51	50@0
NOTE 1: Test Channel Bandwidths are checked separately for each NR band, the applicable channel bandwidths are specified in Table 5.3.5-1.			

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.
2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 7.3E.2.4.3.
3. The V2X Reference Measurement Channel is set according to Table 6.2E.1.1.4.1-1.
4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State Out_of_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.
7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)
8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographical area #1. Wait for the UE to acquire the GNSS signal and start to transmit.

7.3E.2.4.2 Test procedure

1. The UE starts to perform the NR V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.3G.1.4.1-1.
2. Set the signal level of V2X to the appropriate REFSENS value defined in Table 7.3G.1.3-1.
3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.3E.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4.

7.3E.2.5 Test requirement

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.3E.2.5-1.

Table 7.3E.2.5-1: Reference sensitivity of NR V2X Bands (PC5)

		Channel bandwidth / $P_{REFSENS\_V2X}$(dBm)				
NR V2X Band	SCS kHz	10 MHz	20 MHz	30 MHz	40 MHz	Duplex Mode
n38	15	-96.5+TT	-93.2+TT	-91.4+TT	-90.1+TT	HD
	30	-96.1+TT	-93.4+TT	-91.7+TT	-90.2+TT	HD
	60	-96.9+TT	-93.1+TT	-91.9+TT	-90.4+TT	HD
n47	15	-92.5+TT	-89.2+TT	-87.4+TT	-86.1+TT	HD
	30	-92.1+TT	-89.4+TT	-87.7+TT	-86.2+TT	HD
	60	-92.9+TT	-89.1+TT	-87.9+TT	-86.4+TT	HD
NOTE 1: Reference measurement channel is defined in A.8. NOTE 2: The signal power is specified per antenna port. NOTE 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.						

7.3F Reference sensitivity for shared spectrum channel access

7.3F.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

In later clauses of Clause 7 where the value of REFSENS is used as a reference to set the corresponding requirement, the UE shall be verified against those requirements by applying the REFSENS value in Table 7.3G.2-1 with 2 Rx antenna ports tested.

7.3F.2 Reference sensitivity power level

Editor's Note: The following aspects are not yet determined:

- Message content for NS_53 is FFS

- TT for 5.925GHz < f ≤ 7.125GHz is TBD

7.3F.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3F.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.3F.2.3 Minimum conformance requirements

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3F.2.3-1, Table 7.3F.2.3-2, and Table 7.3F.2.3-3.

Table 7.3F.2.3-1: Two antenna port reference sensitivity QPSK PREFSENS

Operating band / SCS / Channel bandwidth					
Operating Band	SCS kHz	20 MHz (dBm)	40 MHz (dBm)	60 MHz (dBm)	80 MHz (dBm)
n46	15	-89.7	-86.6		
	30	-89.9	-86.7	-84.8	-83.6
	60	-90.1	-86.9	-85.0	-83.6
n96	15	-89.2	-86.1		
	30	-89.4	-86.2	-84.3	-83.1
	60	-89.6	-86.4	-84.5	-83.1

For UE(s) equipped with 4 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3F.2.3-1 shall be modified by the amount given in $\Delta R_{IB,4R}$ in Table 7.3F.2.3-2 for the applicable operating bands.

Table 7.3F.2.3-2: Four antenna port reference sensitivity allowance $\Delta R_{IB,4R}$

Operating band	$\Delta R_{IB,4R}$ (dB)
n46, n96	-2.2

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3F.2.3-1 and Table 7.3F.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3F.2.3-3.

Table 7.3F.2.3-3: Uplink configuration for reference sensitivity

Operating band / SCS / Channel bandwidth					
Operating Band	SCS kHz	20 MHz (dBm)	40 MHz (dBm)	60 MHz (dBm)	80 MHz (dBm)
n46	15	100	216		
	30	50	100	162	216
	60	24	50	75	100
n96	15	100	216		
	30	50	100	162	216
	60	24	50	75	100

Unless given by Table 7.3F.2.3-4, the minimum requirements specified in Tables 7.3F.2.3-1 and 7.3F.2.3-2 shall be verified with the network signalling value NS_01 (Table 6.2F.3.1-1) configured.

Table 7.3F.2.3-4: Network signalling value for reference sensitivity

Operating band	Network Signalling value
n46	NS_01
n96	NS_53

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3F.2.

7.3F.2.4 Test description

7.3F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3F.2.4.1-1, Table 7.3F.2.4.1-2, and Table 7.3F.2.4.1-3 The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3F.2.4.1-1: Test Configuration Table

Initial Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal, TL/VL, TL/VH, TH/VL, TH/VH	
Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1			Low range, Mid range, High range	
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1			Lowest, Mid, Highest	
Test SCS as specified in Table 5.3.5-1			Lowest	
Test Parameters				
Test ID	**Downlink Configuration**		**Uplink Configuration**	
	Modulation	**RB allocation**	**Modulation**	**RB allocation**
1	CP-OFDM QPSK	Full RB (NOTE 1)	DFT-s-OFDM QPSK	REFSENS (NOTE 2)
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3F.2.4.1-2. NOTE 2: REFSENS refers to Table 7.3F.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band. NOTE 3: For a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated.				

Table 7.3F.2.4.1-2: Downlink Configuration of each RB allocation

Channel Bandwidth	SCS(kHz)	LCRBmax	Outer RB allocation / Normal RB allocation
20MHz	15	106	106@0
	30	51	51@0
	60	24	24@0
40MHz	15	216	216@0
	30	106	106@0
	60	51	51@0
60MHz	15	N/A	N/A
	30	162	162@0
	60	79	79@0
80MHz	15	N/A	N/A
	30	217	217@0
	60	107	107@0
NOTE 1: Test Channel Bandwidths are checked separately for each NR band, the applicable channel bandwidths are specified in Table 5.3.5-1.			

Table 7.3F.2.4.1-3: Uplink configuration for reference sensitivity, LCRB @ RBstart format

Operating band / SCS / Channel bandwidth						
Operating Band	**SCS kHz**	**20 MHz (dBm)**	**40 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**Duplex Mode**
n46	15	100@0	216@0			TDD
	30	50@0	100@0	162@0	216@0	
	60	24@0	50@0	75@0	100@0	
n96	15	100@0	216@0			TDD
	30	50@0	100@0	162@0	216@0	
	60	24@0	50@0	75@0	100@0	

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The UL and Reference Measurement Channel is set according to Table 7.3F.2.4.1-1, Table 7.3F.2.4.1-2, and Table 7.3F.2.4.1-3.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.3F.2.4.3.

7.3F.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.3F.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.3F.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3F.2.5-1 if 2Rx antennas connected or Table 7.3F.2.5-2 if 4Rx antennas connected. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

7.3F.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED for NR band.

Message contents are according to TS 38.508-1[5] subclause 4.6 with the following exceptions for each network signalling value.

7.3F.2.4.3.1 Message contents exceptions (network signalled value "NS_01")

Message contents according to TS 38.508-1 [5] subclause 4.6 can be used without exceptions.

7.3F.2.4.3.2 Message contents exceptions (network signalled value "NS_53")

FFS

7.3F.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3F.2.5-1 for 2 Rx antenna port, Tables 7.3F.2.5-2 for 4 Rx antenna port, and parameters specified Tables 7.3F.2.4.1-1, Tables 7.3F.2.4.1-2 and Tables 7.3F.2.4.1-3.

Table 7.3F.2.5-1: Reference sensitivity QPSK $P_{REFSENS}$

Operating band / SCS / Channel bandwidth / Duplex-mode						
Operating Band	SCS kHz	20 MHz (dBm)	40 MHz (dBm)	60 MHz (dBm)	80 MHz (dBm)	Duplex Mode
n46	15	-89.7+TT	-86.6+TT			TDD

	30	-89.9+TT	-86.7+TT	-84.8+TT	-83.6+TT	
	60	-90.1+TT	-86.9+TT	-85.0+TT	-83.6+TT	
n96	15	-89.2+TT	-86.1+TT			TDD
	30	-89.4+TT	-86.2+TT	-84.3+TT	-83.1+TT	
	60	-89.6+TT	-86.4+TT	-84.5+TT	-83.1+TT	
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2F.4 NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3F.2.5-3.						

Table 7.3F.2.5-2: Reference sensitivity QPSK $P_{REFSENS}$ for Four Rx antenna ports

Operating band / SCS / Channel bandwidth / Duplex-mode						
Operating Band	**SCS kHz**	**20 MHz (dBm)**	**40 MHz (dBm)**	**60 MHz (dBm)**	**80 MHz (dBm)**	**Duplex Mode**
n46	15	-91.9+TT	-88.8+TT			TDD
	30	-92.1+TT	-88.9+TT	-87.0+TT	-85.8+TT	
	60	-92.3+TT	-89.1+TT	-87.2+TT	-85.8+TT	
n96	15	-91.4+TT	-88.3+TT			TDD
	30	-91.6+TT	-88.4+TT	-86.5+TT	-85.3+TT	
	60	-91.8+TT	-88.6+TT	-86.7+TT	-85.3+TT	
NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE. NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3F.2.5-3.						

Table 7.3F.2.5-3: Test Tolerance (TT) for RX sensitivity level

f ≤ 3.0GHz	**3.0GHz < f ≤ 6.0 GHz**	5.925GHz < f ≤ 7.125GHz
0.7 dB	1.0 dB	TBD

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3F.2.5-1 shall be increased by the amount given in $\Delta R_{IB,c}$ defined in subclause 7.3F.3 for the applicable operating bands.

7.3F.3 ΔRIB,c

For a UE supporting CA or DC band combination, the minimum requirement for reference sensitivity in Table 7.3F.2.3-1 shall be increased by the amount given by $\Delta R_{IB,c}$ defined in Table 7.3F.3-1. Unless otherwise stated, $\Delta R_{IB,c}$ is set to zero.

Table 7.3F.3-1: $\Delta R_{IB,c}$ due to CA (two bands)

Inter-band CA combination	**Operating Band**	**$\Delta R_{IB,c}$ (dB)**
CA_n46-n48	n46	0
	n48	0.5

In case the UE supports more than one of band combinations for CA or DC, and an operating band belongs to more than one band combinations then the applicable additional $\Delta R_{IB,c}$ shall be the maximum value for all band combinations defined in clause 7.3A and 7.3F.3 in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

7.3G Reference sensitivity for Tx Diversity

For UE supporting Tx diversity, the minimum requirements specified in Table FFS and Table FFS shall be met with Tx diversity configuration described in clause 6.2G.1. For Tx diversity, the parameter P_{UMAX} is defined in clause FFS with the sum of the output power from both UE antenna connectors.

7.3I Reference sensitivity for RedCap

7.3I.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3I.2 Reference sensitivity power level

7.3I.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3I.2.2 Test applicability

This test case applies to all types of NR UE release 17 and forward that support NR RedCap.

7.3I.2.3 Minimum conformance requirements

For a RedCap UE equipped with 2 Rx antenna ports, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.2.3-1a and Table 7.3.2.3-1b for the applicable operating bands. The reference sensitivity (REFSENS) requirement specified for a RedCap UE equipped with 2 Rx antenna ports shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3 and, for FDD bands, with the Tx-Rx separation as defined in clause 5.4.4 for the applicable band and UE channel bandwidth.

For a RedCap UE equipped with 1 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3.2.3-1a and in Table 7.3.2.3-1b shall be modified by the amount given in ΔR_{1R} in Table 7.3I.2.3-1 for the applicable operating bands. The reference sensitivity (REFSENS) requirement specified for a RedCap UE equipped with 1 Rx antenna ports shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3 and, for FDD bands, with the Tx-Rx separation as defined in clause 5.4.4 for the applicable band and UE channel bandwidth.

Table 7.3I.2.3-1: Single antenna port reference sensitivity allowance ΔR_{1R}

Operating band	Channel bandwidth (MHz)	ΔR_{1R} (dB)
TDD band	5, 10, 15, 20	2,5
FDD band	5	2.5
FDD band	10, 15, 20	3

For a RedCap UE equipped with 2 Rx antenna ports operating in HD-FDD mode, reference sensitivity for 2Rx antenna ports in Table 7.3I.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3I.2.3-5.

Table 7.3I.2.3-2: HD-FDD RedCap UE with 2 Rx antenna port reference sensitivity

Operating band / SCS / Channel bandwidth					
Operating Band	SCS kHz	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)
n1	15	-100.0	-96.8	-95.0	-93.7
	30		-97.2	-95.2	-93.9
	60		-97.5	-95.4	-94.2
n2	15	-98.8	-95.6	-93.8	-92.5
	30		-96.0	-94.0	-92.7
	60		-96.3	-94.2	-93.0
n3	15	-97.8	-94.6	-92.8	-91.5
	30		-95.0	-93.0	-91.7
	60		-95.3	-93.2	-92.0
n5	15	-98.8	-95.6	-93.8	-92.5
	30		-96.0	-94.0	-92.7
n7	15	-98.8	-95.6	-93.8	-92.5
	30		-96.0	-94.0	-92.7
	60		-96.3	-94.2	-93.0
n8	15	-97.8	-94.6	-92.8	-91.5
	30		-95.0	-93.0	-91.7
n12	15	-97.8	-94.6	-92.8	
	30		-95.0	-93.0	
n13	15	-97.8	-94.6		
	30		-95.0		
n14	15	-97.8	-94.6		
	30		-95.0		
n18	15	-100.0	-96.8	-95.0	
	30		-97.2	-95.2	
n20	15	-97.8	-94.6	-92.8	-91.5
	30		-95.0	-93.0	-91.7
n24	15	-100.0	-96.8		
	30		-97.2		
	60		-97.5		
n25	15	-97.3	-94.1	-92.3	-91.0
	30		-94.5	-92.5	-91.2
	60		-94.8	-92.7	-91.5
n26	15	-98.3	-95.1	-93.3	-92.0
	30		-95.5	-93.5	-92.2
n28	15	-99.3	-96.1	-94.3	-93.0
	30		-96.5	-94.5	-93.2
n30	15	-99.5	-96.3		
	30		-96.7		
n65	15	-100.0	-96.8	-95.0	-93.7
	30		-97.2	-95.2	-93.9
	60		-97.5	-95.4	-94.2
n66	15	-100.0	-96.8	-95.0	-93.7
	30		-97.2	-95.2	-93.9
	60		-97.5	-95.4	-94.2
n70	15	-100.0	-96.8	-95.0	-93.7
	30		-97.2	-95.2	-93.9
	60		-97.5	-95.4	-94.2
n71	15	-98.0	-94.8	-93.0	-91.7
	30		-95.2	-93.2	-91.9
n74	15	-100.0	-96.8	-95.0	-93.7
	30		-97.2	-95.2	-93.9
	60		-97.5	-95.4	-94.2
n85	15	-97.8	-94.6	-92.8	
	30		-95.0	-93.0	

For a RedCap UE equipped with 1 Rx antenna ports and operating in HD-FDD mode, reference sensitivity for 1Rx antenna ports in Table 7.3I.2.3-4 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3I.2.3-5.

Table 7.3I.2.3-4: HD-FDD RedCap UE with 1 Rx antenna port reference sensitivity

Operating band / SCS / Channel bandwidth					
Operating Band	SCS kHz	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)
n1	15	-97.5	-94.3	-92.5	-91.2
	30		-94.7	-92.7	-91.4
	60		-95.0	-92.9	-91.7
n2	15	-96.3	-93.1	-91.3	-90.0
	30		-93.5	-91.5	-90.2
	60		-93.8	-91.7	-90.5
n3	15	-95.3	-92.1	-90.3	-89.0
	30		-92.5	-90.5	-89.2
	60		-92.8	-90.7	-89.5
n5	15	-96.3	-93.1	-91.3	-90.0
	30		-93.5	-91.5	-90.2
n7	15	-96.3	-93.1	-91.3	-90.0
	30		-93.5	-91.5	-90.2
	60		-93.8	-91.7	-90.5
n8	15	-95.3	-92.1	-90.3	-89.0
	30		-92.5	-90.5	-89.2
n12	15	-95.3	-92.1	-90.3	
	30		-92.5	-90.5	
n13	15	-95.3	-92.1		
	30		-92.5		
n14	15	-95.3	-92.1		
	30		-92.5		
n18	15	-97.5	-94.3	-92.5	
	30		-94.7	-92.7	
n20	15	-95.3	-92.1	-90.3	-89.0
	30		-92.5	-90.5	-89.2
n24	15	-97.5	-94.3		
	30		-94.7		
	60		-95.0		
n25	15	-94.8	-91.6	-89.8	-88.5
	30		-92.0	-90.0	-88.7
	60		-92.3	-90.2	-89.0
n26	15	-95.8	-92.6	-90.8	-89.5
	30		-93.0	-91.0	-89.7
n28	15	-96.8	-93.6	-91.8	-90.5
	30		-94.0	-92.0	-90.7
n30	15	-97.0	-93.8		
	30		-94.2		
n65	15	-97.5	-94.3	-92.5	-91.2
	30		-94.7	-92.7	-91.4
	60		-95.0	-92.9	-91.7
n66	15	-97.5	-94.3	-92.5	-91.2
	30		-94.7	-92.7	-91.4
	60		-95.0	-92.9	-91.7
n70	15	-97.5	-94.3	-92.5	-91.2
	30		-94.7	-92.7	-91.4
	60		-95.0	-92.9	-91.7
n71	15	-95.5	-92.3	-90.5	-89.2
	30		-92.7	-90.7	-89.4
n74	15	-97.5	-94.3	-92.5	-91.2
	30		-94.7	-92.7	-91.4
	60		-95.0	-92.9	-91.7
n85	15	-95.3	-92.1	-90.3	
	30		-92.5	-90.5	

Table 7.3I.2.3-5: Uplink configuration for HD-FDD reference sensitivity

Operating band / SCS / Channel bandwidth					
Operating Band	**SCS kHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
n1	15	25	50	75	100
	30		24	36	50
	60		10	18	24
n2	15	25	50	75	100
	30		24	36	50
	60		10	18	24
n3	15	25	50	75	100
	30		24	36	50
	60		10	18	24
n5	15	25	50	75	100
	30		24	36	50
n7	15	25	50	75	100
	30		24	36	50
			10	18	24
n8	15	25	50	75	100
	30		24	36	50
n12	15	25	50	75	
	30		24	36	
n13	15	25	50		
	30		24		
n14	15	25	50		
	30		24		
n18	15	25	50	75	
	30		24	36	
n20	15	25	50	75	100
	30		24	36	50
n24	15	25	50		
	30		24		
			10		
n25	15	25	50	75	100
	30		24	36	50
	60		10	18	24
n26	15	25	50	75	100
	30		24	36	50
n28	15	25	50	75	100
	30		24	36	50
n30	15	25	50		
	30		24		
n65	15	25	50	75	100
	30		24	36	50
			10	18	24
n66	15	25	50	75	100
	30		24	36	50
			10	18	24
n70	15	25	50	75	100
	30		24	36	50
			10	18	24
n71	15	25	50	75	100
	30		24	36	50
n74	15	25	50	75	100
	30		24	36	50
			10	18	24
n85	15	25	50	75	
	30		24	36	

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3I.2.

7.3I.2.4 Test description

7.3I.2.4.1 Initial conditions

For RedCap UE with 1Rx or 2 Rx antenna ports, same initial conditions as in 7.3.2.4.1 with following exception:

- The test channel bandwidth are specified in TS 38.508-1 [5] subclause 4.3.1 for RedCap.

For HD-FDD RedCap UE with 1 Rx or 2 Rx antenna ports, same initial conditions as in 7.3.2.4.1 with following exception:

- The test channel bandwidth are specified in TS 38.508-1 [5] subclause 4.3.1 for RedCap.
- The RB allocation for uplink configuration in Table 7.3.2.4.1-1 refers to Table 7.3I.2.4.1-1 for each SCS, channel BW and NR band.

Table 7.3I.2.4.1-1: Uplink configuration for reference sensitivity of HD-FDD RedCap UE, L_{CRB} @ RBstart format

Operating Band	SCS kHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
n1	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n2	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n3	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n5	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
n7	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n8	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
n12	15	25@0	50@2	75@4		HD-FDD
	30		24@0	36@2		
n14	15	25@0	50@0			HD-FDD
	30		24@0			
n20	15	25@0	50@0	75@0	100@0	HD-FDD
	30		24@0	36@0	50@0	
n24	15	25@0	50@0			HD-FDD
	30		24@0			
	60		10@0			
n25	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n26	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
n28	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
n30	15	25@0	50@2			HD-FDD
	30		24@0			
n65	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n66	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n70	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	
n71	15	25@0	50@0	75@0	100@0	HD-FDD
	30		24@0	36@0	50@0	
n74	15	25@0	50@2	75@4	100@6	HD-FDD
	30		24@0	36@2	50@1	
	60		10@1	18@0	24@0	

7.3I.2.4.2 Test procedure

Same test procedure as steps 1~4 of clause 7.3.2.4.2 with the following exceptions of step 3.

- Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3I.2.5-1, 7.3I.2.5-2 and 7.3I.2.5-5 if 2Rx antennas connected or Tables 7.3I.2.5-3, 7.3I.2.5-4 and 7.3I.2.5-6 if 1Rx antennas connected.

7.3I.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED for NR band.

7.3I.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Table 7.3I.2.5-1 and Table 7.3I.2.5-2 for RedCap UE with 2 Rx antenna port, Tables 7.3I.2.5-3 and Table 7.3I.2.5-4 for RedCap UE with single antenna port, Table 7.3I.2.5-5 for HD-FDD RedCap UE with 2 Rx antenna port, Table 7.3I.2.5-6 for HD-FDD RedCap UE single antenna port, and parameters specified Table 7.3.2.4.1-1, Table 7.3.2.4.1-2 and Table 7.3I.2.4.1-1.

Table 7.3I.2.5-1: Two antenna port Reference sensitivity QPSK $P_{REFSENS}$ for FDD bands

Operating band / SCS / Channel bandwidth / REFSENS / Duplex Mode						
Operating Band	SCS kHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
n1	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n2	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT	FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT	
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT	
n3	15	-97.0 +TT	-93.8 +TT	-92.0 +TT	-90.8 +TT	FDD
	30		-94.1 +TT	-92.1 +TT	-91.0 +TT	
	60		-94.5 +TT	-92.4 +TT	-91.2 +TT	
n5	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-90.8 +TT	FDD
	30		-95.1 +TT	-93.1 +TT	-91.0 +TT	
n7	15	-98.0 +TT	-94.8 +TT	-93.0 +TT	-91.8 +TT	FDD
	30		-95.1 +TT	-93.1 +TT	-92.0 +TT	
	60		-95.5 +TT	-93.4 +TT	-92.2 +TT	
n8	15	-97.0 +TT	-93.8 +TT	-91.4 +TT	-85.5 +TT	FDD
	30		-94.1 +TT	-91.7 +TT	-87.2 +TT	
n12	15	-97.0 +TT	-93.8 +TT	-84.0 +TT		FDD
	30		-94.1 +TT	-84.1 +TT		
n14	15	-97.0 +TT	-93.8 +TT			FDD
	30		-94.1 +TT			
n20	15	-97.0 +TT	-93.8 +TT	-91.0 +TT	-89.8 +TT	FDD
	30		-94.1 +TT	-91.1 +TT	-90.0 +TT	
n24	15	-100.0 +TT	-96.8 +TT			FDD
	30		-97.1 +TT			
	60		-97.5 +TT			
n25	15	-96.5 +TT	-93.3 +TT	-91.5 +TT	-90.3 +TT	FDD
	30		-93.6 +TT	-91.6 +TT	-90.5 +TT	
	60		-94.0 +TT	-91.9 +TT	-90.7 +TT	
n26	15	-97.5 +TT	-94.5 +TT	-92.7 +TT	-87.6 +TT	FDD
	30		-94.8 +TT	-92.7 +TT	-87.7 +TT	

n28	15	-98.5 +TT	-95.5 +TT	-93.5 +TT	-90.8 +TT	FDD
	30		-95.6 +TT	-93.6 +TT	-91.0 +TT	
n30	15	-99.0 +TT	-95.8 +TT			FDD
	30		-96.1 +TT			
n65	15	-99.5+TT	-96.3+TT	-94.5+TT	-93.3+TT	FDD
	30		-96.6+TT	-94.6+TT	-93.5+TT	
	60		-97.0+TT	-94.9+TT	-93.7+TT	
n66	15	-99.5 +TT	-96.3 +TT	-94.5 +TT	-93.3 +TT	FDD
	30		-96.6 +TT	-94.6 +TT	-93.5 +TT	
	60		-97.0 +TT	-94.9 +TT	-93.7 +TT	
n70	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.8 +TT	FDD
	30		-97.1 +TT	-95.1 +TT	-94.0 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n71	15	-97.2 +TT	-94.0 +TT	-91.6 +TT	-86.0 +TT	FDD
	30		-94.3 +TT	-91.9 +TT	-87.4 +TT	
n74	15	-99.5[3] +TT	-96.3[3] +TT	-94.5[3] +TT	-93.3[3] +TT	FDD
	30		-96.6[3] +TT	-94.6[3] +TT	-93.5[3] +TT	
	60		-97.0[3] +TT	-94.9[3] +TT	-93.7[3] +TT	
NOTE 1: Void NOTE 2: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.4 NOTE 3: [3] indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz. NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.						

Table 7.3I.2.5-2: Two antenna port reference sensitivity QPSK PREFSENS for TDD bands

Operating band / SCS / Channel bandwidth / REFSENS / Duplex Mode				
Operating band	SCS kHz	Channel bandwidth (MHz)	REFSENS (dBm)[8]	Duplex Mode

n34	15	5, 10, 15	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15	-97.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15	-97.5 + 10log$_{10}$(N_{RB}/11)+TT	
n38[1]	15	5, 10, 15, 20	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15, 20,	-97.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20	-97.5 + 10log$_{10}$(N_{RB}/11)+TT	
n39	15	5, 10, 15, 20	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15, 20	-97.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20,	-97.5 + 10log$_{10}$(N_{RB}/11)+TT	
n40	15	5, 10, 15, 20	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15, 20	-97.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20	-97.5 + 10log$_{10}$(N_{RB}/11)+TT	
n41[1]	15	10, 15, 20	-94.8 + 10log$_{10}$(N_{RB}/50)+TT	TDD
	30	10, 15, 20	-95.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20	-95.5 + 10log$_{10}$(N_{RB}/11)+TT	
n48[1]	15	5, 10, 15, 20,	-99 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15, 20,	-96.1 + 10log$_{10}$(N_{RB}/24) +TT	
	60	10, 15, 20,	-96.5 + 10log$_{10}$(N_{RB}/11)+TT	
n50	15	5, 10, 15, 20	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10, 15, 20	-97.1 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20	-97.5 + 10log$_{10}$(N_{RB}/11)+TT	
n51	15	5	-100+TT	TDD
n53	15	5, 10	-100 + 10log$_{10}$(N_{RB}/25)+TT	TDD
	30	10	-97.1+TT	
	60	10	-97.5+TT	
n77[1,4]	15	10, 15, 20,	-95.3 + 10log$_{10}$(N_{RB}/50)+TT	TDD
	30	10, 15, 20	-95.6 + 10log$_{10}$(N_{RB}/24)+TT	
	60	10, 15, 20	-96.0 + 10log$_{10}$(N_{RB}/11)+TT	
n78[1]	15	10, 15, 20	-95.8 + 10log$_{10}$(N_{RB}/50) +TT	TDD
	30	10, 15, 20	-96.1 + 10log$_{10}$(N_{RB}/24) +TT	
	60	10, 15, 20	-96.5 + 10log$_{10}$(N_{RB}/11)+TT	
n79[1]	15	10, 20,	-89.6 + 10log$_{10}$(N_{RB}/216)+TT	TDD
	30	10, 20,	-89.7 + 10log$_{10}$(N_{RB}/106) +TT	
	60	10, 20	-89.9 + 10log$_{10}$(N_{RB}/51) +TT	

NOTE 1:	Void.
NOTE 2:	The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4.
NOTE 3:	Void
NOTE 4:	The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5:	Void
NOTE 6:	Void
NOTE 7:	Void
NOTE 8:	The REFSENS value is rounded to the nearest number down to one decimal point. "N_{RB}" in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.
NOTE 9:	TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.

Table 7.3I.2.5-3: Single antenna port Reference sensitivity QPSK PREFSENS for FDD bands

Operating band / SCS / Channel bandwidth / Duplex-mode						
Operating Band	**SCS kHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Duplex Mode**
n1	15	-100.0+2.5 +TT	-96.8 +3 +TT	-95.0 +3 +TT	-93.8 +3 +TT	FDD
	30		-97.1 +3 +TT	-95.1 +3 +TT	-94.0 +3 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n2	15	-98.0 +2.5+TT	-94.8 +3 +TT	-93.0 +3 +TT	-91.8 +3 +TT	FDD
	30		-95.1 +3 +TT	-93.1 +3 +TT	-92.0 +3 +TT	
	60		-95.5 +3 +TT	-93.4 +3 +TT	-92.2 +3 +TT	
n3	15	-97.0+2.5 +TT	-93.8 +3 +TT	-92.0 +3 +TT	-90.8 +3 +TT	FDD
	30		-94.1 +3 +TT	-92.1 +3 +TT	-91.0 +3 +TT	
	60		-94.5 +3 +TT	-92.4 +3 +TT	-91.2 +3 +TT	
n5	15	-98.0+2.5 +TT	-94.8 +3 +TT	-93.0 +3 +TT	-90.8 +3 +TT	FDD
	30		-95.1 +3 +TT	-93.1 +3 +TT	-91.0 +3 +TT	
n7	15	-98.0+2.5 +TT	-94.8 +3 +TT	-93.0 +3 +TT	-91.8 +3 +TT	FDD
	30		-95.1 +3 +TT	-93.1 +3 +TT	-92.0 +3 +TT	
	60		-95.5 +3 +TT	-93.4 +3 +TT	-92.2 +3 +TT	
n8	15	-97.0+2.5 +TT	-93.8 +3 +TT	-91.4 +3 +TT	-85.8 +3 +TT	FDD
	30		-94.1 +3 +TT	-91.7 +3 +TT	-87.2 +3 +TT	
n12	15	-97.0 +2.5+TT	-93.8 +3 +TT	-84.0 +3 +TT		FDD
	30		-94.1 +3 +TT	-84.1 +3 +TT		
n14	15	-97.0+2.5 +TT	-93.8 +3 +TT			FDD
	30		-94.1 +3 +TT			
n20	15	-97.0 +2.5+TT	-93.8 +3 +TT	-91.0 +3 +TT	-89.8 +3 +TT	FDD
	30		-94.1 +3 +TT	-91.1 +3 +TT	-90.0 +3 +TT	
n24	15	-100.0 +2.5+TT	-96.8 +3 +TT			FDD
	30		-97.1 +3 +TT			
	60		-97.5 +3 +TT			
n25	15	-96.5 +2.5+TT	-93.3 +3 +TT	-91.5 +3 +TT	-90.3 +3 +TT	FDD
	30		-93.6 +3 +TT	-91.6 +3 +TT	-90.5 +3 +TT	
	60		-94.0 +3 +TT	-91.9 +3 +TT	-90.7 +3 +TT	
n26	15	-97.5+2.5 +TT	-94.5 +3 +TT	-92.7 +3 +TT	-87.6 +3 +TT	FDD
	30		-94.8 +3 +TT	-92.7 +3 +TT	-87.7 +3 +TT	

n28	15	-98.5 +2.5+TT	-95.5 +3 +TT	-93.5 +3 +TT	-90.8 +3 +TT	FDD
	30		-95.6 +3 +TT	-93.6 +3 +TT	-91.0 +3 +TT	
n30	15	-99.0 +2.5+TT	-95.8 +3 +TT			FDD
	30		-96.1 +3 +TT			
n65	15	-99.5 +2.5+TT	-96.3 +3+TT	-94.5 +3+TT	-93.3 +3+TT	FDD
	30		-96.6 +3 +TT	-94.6 +3 +TT	-93.5 +3 +TT	
	60		-97.0 +3+TT	-94.9 +3+TT	-93.7 +3+TT	
n66	15	-99.5 +2.5+TT	-96.3 +3+TT	-94.5 +3 +TT	-93.3 +3 +TT	FDD
	30		-96.6 +3 +TT	-94.6 +3 +TT	-93.5 +3+TT	
	60		-97.0 +3 +TT	-94.9 +3 +TT	-93.7 +3 +TT	
n70	15	-100.0 +2.5 +TT	-96.8 +3 +TT	-95.0 +3+TT	-93.8 +3 +TT	FDD
	30		-97.1 +3 +TT	-95.1 +3 +TT	-94.0 +3 +TT	
	60		-97.5 +3 +TT	-95.4 +3 +TT	-94.2 +3 +TT	
n71	15	-97.2+2.5 +TT	-94.0 +3 +TT	-91.6 +3 +TT	-86.0 +3 +TT	FDD
	30		-94.3 +3 +TT	-91.9 +3 +TT	-87.4 +3 +TT	
n74	15	-99.5[3] +2.5 +TT	-96.3[3] +3 +TT	-94.5[3] +3 +TT	-93.3[3] +3+TT	FDD
	30		-96.6[3] +3 +TT	-94.6[3] +3 +TT	-93.5[3] +3 +TT	
	60		-97.0[3] +3 +TT	-94.9[3] +3 +TT	-93.7[3] +3+TT	

NOTE 1: Void
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.4
NOTE 3: [3] indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.
NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.

Table 7.3I.2.5-4: Single antenna port reference sensitivity QPSK PREFSENS for TDD bands

Operating band / SCS / Channel bandwidth / REFSENS/Duplex Mode				
Operating band	**SCS kHz**	**Channel bandwidth (MHz)**	**REFSENS (dBm)[8]**	**Duplex Mode**
n34	15	5, 10, 15	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15	$-97.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15	$-97.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n38[1]	15	5, 10, 15, 20,	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15, 20,	$-97.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-97.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n39	15	5, 10, 15, 20	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15, 20,	$-97.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20,	$-97.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n40	15	5, 10, 15, 20	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15, 20	$-97.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-97.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n41[1]	15	10, 15, 20	$-94.8 + 10\log_{10}(N_{RB}/50) +2.5+TT$	TDD
	30	10, 15, 20	$-95.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-95.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n48[1]	15	5, 10, 15, 20,	$-99 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15, 20,	$-96.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20,	$-96.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n50	15	5, 10, 15, 20	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10, 15, 20	$-97.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-97.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n51	15	5	-100 +2.5+TT	TDD
n53	15	5, 10	$-100 + 10\log_{10}(N_{RB}/25) +2.5+TT$	TDD
	30	10	-97.1 +2.5+TT	
	60	10	-97.5 +2.5+TT	
n77[1,4]	15	10, 15, 20,	$-95.3 + 10\log_{10}(N_{RB}/50) +2.5+TT$	TDD
	30	10, 15, 20	$-95.6 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-96.0 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n78[1]	15	10, 15, 20	$-95.8 + 10\log_{10}(N_{RB}/50) +2.5+TT$	TDD
	30	10, 15, 20	$-96.1 + 10\log_{10}(N_{RB}/24) +2.5+TT$	
	60	10, 15, 20	$-96.5 + 10\log_{10}(N_{RB}/11) +2.5+TT$	
n79[1]	15	10, 20,	$-89.6 + 10\log_{10}(N_{RB}/216) +2.5+TT$	TDD

	30	10, 20,	$-89.7 + 10\log_{10}(N_{RB}/106) +2.5+TT$	
	60	10, 20	$-89.9 + 10\log_{10}(N_{RB}/51) +2.5+TT$	

NOTE 1: Void.
NOTE 2: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4.
NOTE 3: Void
NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.
NOTE 5: Void
NOTE 6: Void
NOTE 7: Void
NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. "N_{RB}" in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.
NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.

Table 7.3I.2.5-5: Two antenna port reference sensitivity QPSK PREFSENS for HD-FDD operation

Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode						
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**Duplex Mode**
n1	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.7 +TT	HD-FDD
	30		-97.2 +TT	-95.2 +TT	-93.9 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n2	15	-98.8 +TT	-95.6 +TT	-93.8 +TT	-92.5 +TT	HD-FDD
	30		-96.0 +TT	-94.0 +TT	-92.7 +TT	
	60		-96.3 +TT	-94.2 +TT	-93.0 +TT	
n3	15	-97.8 +TT	-94.6 +TT	-92.8 +TT	-91.5 +TT	HD-FDD
	30		-95.0 +TT	-93.0 +TT	-91.7 +TT	
	60		-95.3 +TT	-93.2 +TT	-92.0 +TT	
n5	15	-98.8 +TT	-95.6 +TT	-93.8 +TT	-92.5 +TT	HD-FDD
	30		-96.0 +TT	-94.0 +TT	-92.7 +TT	
n7	15	-98.8 +TT	-95.6 +TT	-93.8 +TT	-92.5 +TT	HD-FDD
	30		-96.0 +TT	-94.0 +TT	-92.7 +TT	
	60		-96.3 +TT	-94.2 +TT	-93.0 +TT	
n8	15	-97.8 +TT	-94.6 +TT	-92.8 +TT	-91.5 +TT	HD-FDD
	30		-95.0 +TT	-93.0 +TT	-91.7 +TT	
n12	15	-97.8 +TT	-94.6 +TT	-92.8 +TT		HD-FDD
	30		-95.0 +TT	-93.0 +TT		
n13	15	-97.8 +TT	-94.6 +TT			HD-FDD
	30		-95.0 +TT			
n14	15	-97.8 +TT	-94.6 +TT			HD-FDD
	30		-95.0 +TT			
n18	15	-100.0 +TT	-96.8 +TT	-95.0 +TT		HD-FDD
	30		-97.2 +TT	-95.2 +TT		
n20	15	-97.8 +TT	-94.6 +TT	-92.8 +TT	-91.5 +TT	HD-FDD
	30		-95.0 +TT	-93.0 +TT	-91.7 +TT	
n24	15	-100.0 +TT	-96.8 +TT			HD-FDD
	30		-97.2 +TT			
	60		-97.5 +TT			
n25	15	-97.3 +TT	-94.1 +TT	-92.3 +TT	-91.0 +TT	HD-FDD

Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode						
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**Duplex Mode**
	30		-94.5 +TT	-92.5 +TT	-91.2 +TT	
	60		-94.8 +TT	-92.7 +TT	-91.5 +TT	
n26	15	-98.3 +TT	-95.1 +TT	-93.3 +TT	-92.0 +TT	HD-FDD
	30		-95.5 +TT	-93.5 +TT	-92.2 +TT	
n28	15	-99.3 +TT	-96.1 +TT	-94.3 +TT	-93.0 +TT	HD-FDD
	30		-96.5 +TT	-94.5 +TT	-93.2 +TT	
n30	15	-99.5 +TT	-96.3 +TT			HD-FDD
	30		-96.7 +TT			
n65	15	-100.0 +TT	-96.8+TT	-95.0 +TT	-93.7 +TT	HD-FDD
	30		-97.2 +TT	-95.2 +TT	-93.9 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n66	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.7 +TT	HD-FDD
	30		-97.2 +TT	-95.2 +TT	-93.9 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n70	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.7 +TT	HD-FDD
	30		-97.2 +TT	-95.2 +TT	-93.9 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n71	15	-98.0 +TT	-94.8	-93.0 +TT	-91.7 +TT	HD-FDD
	30		-95.2 +TT	-93.2 +TT	-91.9 +TT	
n74	15	-100.0 +TT	-96.8 +TT	-95.0 +TT	-93.7 +TT	HD-FDD
	30		-97.2 +TT	-95.2 +TT	-93.9 +TT	
	60		-97.5 +TT	-95.4 +TT	-94.2 +TT	
n85	15	-97.8 +TT	-94.6 +TT	-92.8 +TT		HD-FDD
	30		-95.0 +TT	-93.0 +TT		
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4. NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.						

Table 7.3I.2.5-6: Single antenna port Reference sensitivity QPSK PREFSENS for HD-FDD operation

Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode						
Operating Band	SCS kHz	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
n1	15	-97.5 +TT	-94.3 +TT	-92.5 +TT	-91.2 +TT	HD-FDD
	30		-94.7 +TT	-92.7 +TT	-91.4 +TT	
	60		-95.0 +TT	-92.9 +TT	-91.7 +TT	
n2	15	-96.3 +TT	-93.1 +TT	-91.3 +TT	-90.0 +TT	HD-FDD
	30		-93.5 +TT	-91.5	-90.2	
	60		-93.8 +TT	-91.7 +TT	-90.5 +TT	
n3	15	-95.3 +TT	-92.1 +TT	-90.3 +TT	-89.0 +TT	HD-FDD
	30		-92.5 +TT	-90.5 +TT	-89.2 +TT	
	60		-92.8 +TT	-90.7 +TT	-89.5 +TT	
n5	15	-96.3 +TT	-93.1 +TT	-91.3 +TT	-90.0 +TT	HD-FDD
	30		-93.5 +TT	-91.5 +TT	-90.2 +TT	
n7	15	-96.3 +TT	-93.1 +TT	-91.3 +TT	-90.0 +TT	HD-FDD
	30		-93.5 +TT	-91.5 +TT	-90.2 +TT	
	60		-93.8 +TT	-91.7 +TT	-90.5 +TT	
n8	15	-95.3 +TT	-92.1 +TT	-90.3 +TT	-89.0 +TT	HD-FDD
	30		-92.5 +TT	-90.5 +TT	-89.2 +TT	
n12	15	-95.3 +TT	-92.1 +TT	-90.3 +TT		HD-FDD
	30		-92.5 +TT	-90.5 +TT		
n13	15	-95.3 +TT	-92.1 +TT			HD-FDD
	30		-92.5 +TT			
n14	15	-95.3 +TT	-92.1 +TT			HD-FDD
	30		-92.5 +TT			
n18	15	-97.5 +TT	-94.3 +TT	-92.5 +TT		HD-FDD
	30		-94.7 +TT	-92.7 +TT		
n20	15	-95.3 +TT	-92.1 +TT	-90.3 +TT	-89.0 +TT	HD-FDD
	30		-92.5 +TT	-90.5 +TT	-89.2 +TT	
n24	15	-97.5 +TT	-94.3 +TT			HD-FDD
	30		-94.7 +TT			
	60		-95.0 +TT			
n25	15	-94.8 +TT	-91.6 +TT	-89.8 +TT	-88.5 +TT	HD-FDD
	30		-92.0 +TT	-90.0 +TT	-88.7 +TT	

Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode						
Operating Band	**SCS kHz**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**Duplex Mode**
	60		-92.3 +TT	-90.2 +TT	-89.0 +TT	
n26	15	-95.8 +TT	-92.6 +TT	-90.8 +TT	-89.5 +TT	HD-FDD
	30		-93.0 +TT	-91.0 +TT	-89.7 +TT	
n28	15	-96.8 +TT	-93.6 +TT	-91.8 +TT	-90.5 +TT	HD-FDD
	30		-94.0 +TT	-92.0 +TT	-90.7 +TT	
n30	15	-97.0 +TT	-93.8 +TT			HD-FDD
	30		-94.2 +TT			
n65	15	-97.5 +TT	-94.3 +TT	-92.5 +TT	-91.2 +TT	HD-FDD
	30		-94.7 +TT	-92.7 +TT	-91.4 +TT	
	60		-95.0 +TT	-92.9 +TT	-91.7 +TT	
n66	15	-97.5 +TT	-94.3 +TT	-92.5 +TT	-91.2 +TT	HD-FDD
	30		-94.7 +TT	-92.7 +TT	-91.4 +TT	
	60		-95.0 +TT	-92.9 +TT	-91.7 +TT	
n70	15	-97.5 +TT	-94.3 +TT	-92.5 +TT	-91.2 +TT	HD-FDD
	30		-94.7 +TT	-92.7 +TT	-91.4 +TT	
	60		-95.0 +TT	-92.9 +TT	-91.7 +TT	
n71	15	-95.5 +TT	-92.3 +TT	-90.5 +TT	-89.2 +TT	HD-FDD
	30		-92.7 +TT	-90.7 +TT	-89.4 +TT	
n74	15	-97.5 +TT	-94.3 +TT	-92.5 +TT	-91.2 +TT	HD-FDD
	30		-94.7 +TT	-92.7 +TT	-91.4 +TT	
	60		-95.0 +TT	-92.9 +TT	-91.7	
n85	15	-95.3 +TT	-92.1 +TT	-90.3 +TT		HD-FDD
	30		-92.5 +TT	-90.5 +TT		
NOTE 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.4. NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7.						

Table 7.3I.2.5-7: Test Tolerance (TT) for RX sensitivity level for RedCap UE

f ≤ 3.0GHz	3.0GHz < f ≤ 6.0 GHz
0.7 dB	1.0 dB

7.4 Maximum input level

7.4.1 Test purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to a g-NodeB.

7.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.4.3 Minimum conformance requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel. The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.3-1.

Table 7.4.3-1: Maximum input level

Rx Parameter	Units	Channel bandwidth (MHz)		
		5, 10, 15, 20	25, 30, 35, 40, 45, 50	60, 70, 80, 90, 100
Power in Transmission Bandwidth Configuration[4]	dBm	-25[2]	$-25 + 10\log_{10}(BW_{Channel}/20)$[Note 2]	-20[2]
		-27[3,5]	$-27 + 10\log_{10}(BW_{Channel}/20)$[Note 3,5]	-22[3,5]
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4. NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM. NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM. NOTE 4: $10\log_{10}(x)$ is rounded to the nearest 0.5dB value. NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM.				

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4.

7.4.4 Test description

7.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4.4.1-1: Test Configuration Table

Initial Conditions			
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal	
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range (NOTE 5)	
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 4)	
Test SCS as specified in Table 5.3.5-1		Lowest	
Test Parameters for Channel Bandwidths			
Downlink Configuration		**Uplink Configuration**	
Modulation	**RB allocation**	**Modulation**	**RB allocation**
CP-OFDM 64 QAM	NOTE 1	DFT-s-OFDM QPSK	NOTE 2
CP-OFDM 256 QAM	NOTE 1	DFT-s-OFDM QPSK	NOTE 2
NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2. NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected. NOTE 4: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.			

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 , and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.4.4.3.

7.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.4.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.4.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.4.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.4.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.4.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.4.5-1.

Table 7.4.5-1: Maximum input level

Rx Parameter	Units	Channel bandwidth (MHz)		
		5, 10, 15, 20	25, 30, 35, 40, 45, 50	60, 70, 80, 90, 100
Power in Transmission Bandwidth Configuration[4]	dBm	-25^{2} -TT	$-25 + 10\log_{10}(BW_{Channel}/20)^{Note\ 2}$ -TT	-20^{2} -TT
		$-27^{3,5}$ -TT	$-27 + 10\log_{10}(BW_{Channel}/20)^{Note\ 3,5}$ -TT	$-22^{3,5}$ -TT

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4.
NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.
NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.
NOTE 4: $10\log_{10}(x)$ is rounded to the nearest 0.5dB value.
NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM.

Table 7.4.5-2: Void

Table 7.4.5-3: Test Tolerance (Maximum input level)

f ≤ 3.0GHz	3.0GHz < f ≤6.0GHz
0.7 dB	1.0 dB

7.4A Maximum input level for CA

7.4A.0 Minimum conformance requirements

7.4A.0.1 Maximum input level for Intra-band contiguous CA

For intra-band contiguous carrier aggregation maximum input level is defined as the maximum mean power received at the UE antenna port, over the Transmission bandwidth configuration of each CC.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4A.0.1-1 for each component carrier.

Table 7.4A.0.1-1: Maximum input level for Intra-band contiguous CA

Rx Parameter	Units	NR CA Bandwidth Class			
		B	C	D	

Power in largest transmission bandwidth configuration CC, $P_{largest\ BW}$	dBm	-23^{2}	-23^{2}	-25^{2}	
		-25^{3}	-25^{3}	-27^{3}	
Power in each other CC	dBm	$P_{largest\ BW} + 10*\log\{(N_{RB,c}*SCS_c)/(N_{RB,largest\ BW}*SCS_{largest\ BW})\}$			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ as defined in subclause 6.2.4.3. NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM. NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.					

7.4A.0.2 Maximum input level for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the maximum input level requirements are defined with the uplink configuration in accordance with 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified subclause 7.4.3 and Table 7.4A.0.1-1 for one component carrier and two component carriers per sub-block, respectively. The throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the specified reference measurement channel as specified in Annex A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1 and A.5.2.1. The requirements apply with all downlink carriers active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4A.

7.4A.0.3 Maximum input level for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the maximum input level is defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.4.3 for each component carrier while all downlink carriers are active.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) for each component carrier.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4A.

7.4A.1 Maximum input level for CA (2DL CA)

7.4A.1.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.4A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.1.4 Test description

7.4A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.4A.1.4.1-1 or 7.4A.1.4.1-2. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.1.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Mid range		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			NOTE 1		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM 64QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.					

Table 7.4A.1.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1, NOTE 3		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			NOTE 1, NOTE 4		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM 64QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-2. Only test points verifying non-exceptional REFSENS requirements are used for maximum input level. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

Table 7.4A.1.4.1-3: Test configuration table for Intra-band non-contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.			NOTE 1, NOTE 3		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM 64QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1

NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3. Only test points verifying non-exceptional REFSENS requirements are used for maximum input level.

NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.

NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.
4. The DL and UL Reference Measurement Channels are set according to Table 7.4A.1.4.1-1, Table 7.4A.1.4.1-2 or Table 7.4A.1.4.1-3.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.4A.1.4.3.

7.4A.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and C.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.1.4.3.
3. SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).
4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.4A.1.4.1-1 for intra-band contiguous CA, 7.4A.1.4.1-2 for inter-band CA or 7.4A.1.4.1-3 for intra-band non-contiguous CA on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.4A.1.4.1-1 for intra-band contiguous CA, 7.4A.1.4.1-2 for inter-band CA or 7.4A.1.4.1-3 for intra-band non-contiguous CA. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.4A.1.5-1 for intra-band contiguous CA, Table 7.4A.1.5-2 for inter-band CA or Table 7.4A.1.5-3 for intra-band non-contiguous CA. Send uplink power control commands to the UE using 1dB step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.4A.1.5-1 for intra-band contiguous CA, Table 7.4A.1.5-2 for inter-band CA or 7.4A.1.5-3 for intra-band non-contiguous CA for at least the duration of the Throughput measurement ,where:

    - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

    - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7. For intra-band contiguous and non-contiguous CA: measure the average throughput of each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

For inter-band CA: measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

8. For Inter-band CA only: Repeat steps from 1 to 7 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, except for operating bands without uplink band.

7.4A.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.4A.1.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.1.5-1 for intra-band contiguous CA or Table 7.4A.1.5-2 for inter-band CA.

Table 7.4A.1.5-1: Maximum input level for Intra-band contiguous CA

Rx Parameter	Units	NR CA Bandwidth Class		
		B	CD	E
Power in largest transmission bandwidth configuration CC, $P_{largest\ BW}$	dBm	-23[2]-TT	-23[2]-TT-25[2]-TT	-26[2]-TT
		-25[3]-TT	-25[3]-TT-27[3]-TT	-28[3]-TT
Power in each other CC	dBm	$P_{largest\ BW}$ +10*log{($N_{RB,c}$*SCS_c)/($N_{RB,largest\ BW}$*$SCS_{largest\ BW}$)} -TT		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ as defined in subclause 6.2.4.3. NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM. NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM. NOTE 4: TT for each frequency is specified in Table 7.4A.1.5-5.				

Table 7.4A.1.5-2: Maximum input level for inter-band

Rx Parameter	Units	Channel bandwidth												
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
Power in Transmission Bandwidth Configuration	dBm	-25[2]-TT				-24[2]-TT	-23[2]-TT	-22[2]-TT	-21[2]-TT	-20[2]-TT				
		-27[3]-TT				-26[3]-TT	-25[3]-TT	-24[3]-TT	-23[3]-TT	-22[3]-TT				

NOTE 1: The transmitter shall be set to 4dB below P_{CMAX_L} at the minimum uplink configuration specified in Table 7.3.2.3-3 with P_{CMAX_L} as defined in subclause 6.2.4.
NOTE 2: Reference measurement channel is Annex A.3.2.3/A.3.3.3 for 64-QAM.
NOTE 3: Reference measurement channel is Annex A.3.2.4/A.3.3.4 for 256-QAM.
NOTE 4: TT for each frequency is specified in Table 7.4A.1.5-5.

Table 7.4A.1.5-3: Maximum input level for intra-band non-contiguous

Rx Parameter	Units	Channel bandwidth												
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
Power in Transmission Bandwidth Configuration	dBm	-25[2]-TT				-24[2]-TT	-23[2]-TT	-22[2]-TT	-21[2]-TT	-20[2]-TT				
		-27[3]-TT				-26[3]-TT	-25[3]-TT	-24[3]-TT	-23[3]-TT	-22[3]-TT				

NOTE 1: The transmitter shall be set to 4dB below P_{CMAX_L} at the minimum uplink configuration specified in Table 7.3.2.3-3 with P_{CMAX_L} as defined in subclause 6.2.4.
NOTE 2: Reference measurement channel is Annex A.3.2.3/A.3.3.3 for 64-QAM.
NOTE 3: Reference measurement channel is Annex A.3.2.4/A.3.3.4 for 256-QAM.
NOTE 4: TT for each frequency is specified in Table 7.4A.1.5-5.

Table 7.4A.1.5-4: Void

Table 7.4A.1.5-5: Test Tolerance (Maximum input level)

f ≤ 3.0GHz	3.0GHz < f ≤6.0GHz
0.7 dB	1.0 dB

7.4A.2 Maximum input level for CA (3DL CA)

7.4A.2.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.4A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.2.4 Test description

7.4A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.4A.2.4.1-1, 7.4A.2.4.1-2 or 7.4A.2.4.1-3. The details of the uplink and downlink reference measurement channels

(RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.2.4.1-1: Test Configuration Table for 3DL CA

Default Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Intra-band contiguous: Mid range for PCC and SCCs Inter-band: NOTE 1, NOTE 5 Intra-band contiguous + Inter-band: NOTE 1, NOTE 5 Intra-band non-contiguous + Inter-band: NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1 (NOTE 5)
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	NOTE 1, NOTE 6
Test SCS as specified in Table 5.3.5-1	Lowest for PCC and SCCs
Network signalling value	NS_01 by default

Test Parameters						
	Downlink Configuration				**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC$_1$ RB allocation**	**SCC$_2$ RB allocation**	**CC Mod'n**	**PCC RB allocation**
Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)						
1	CP-OFDM 64QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)						
1	CP-OFDM 64QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)						
1	CP-OFDM 64QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)						
1	CP-OFDM 64QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1

NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for maximum input level testing.

NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.

NOTE 3: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, X=1, Y =8.

NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.

NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.

NOTE 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.

Table 7.4A.2.4.1-2: Void

Table7.4A.2.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.4A.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.4A.2.4.3.

7.4A.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.4A.2.4.1-1 to Table 7.4A.2.4.1-3 as appropriate for PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.4A.2.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.4A.2.5-1 and Table 7.4A.2.5-2 according to the type of CA. Send uplink power control commands to the UE using 1dB step size to ensure that the PCC output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.4A.2.5-1 or Table 7.4A.2.5-2 as appropriate for at least the duration of the Throughput measurement ,where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.2.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.2.4.2-1.

Table 7.4A.2.4.2-1: Test repetition and measurement configuration

CA configuration	Test ID (NOTE1)	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1.2	1^5	PCC, SCC_1, SCC_2	Table 7.4A.2.5-1
Inter-band	1,2	1^2, 2^2, 3^2	SCC1, SCC2	Table 7.4A.2.5-2
Intra-band contiguous + Inter-band	1,2	1^3	SCC2	Table 7.4A.2.5-2
		2^3	SCC1, SCC2	Table 7.4A.2.5-1
Intra-band non-contiguous + Inter-band	1,2	1^4	SCC2	Table 7.4A.2.5-2
		2^4	SCC1, SCC2	Table 7.4A.2.5-2

NOTE 1: Refers to Test IDs in Table 7.4A.2.4.1-1
NOTE 2: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)" in table 7.3A.2.4.1-11.
NOTE 3: CA configuration ID as defined in "Default Test Settings for a CA_nXC-YA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)" in table 7.3A.2.4.1-2.
NOTE 4: CA configuration ID as defined in "Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)" in table 7.3A.2.4.1-1.
NOTE 5: CA configuration ID as defined in "Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)" in table 7.3A.2.4.1-1.

7.4A.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.4A.2.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.2.5-1 and Table 7.4A.2.5-2 as applicable.

Table 7.4A.2.5-1: Maximum input level for 3DL CA (Intra-band contiguous)

Rx Parameter	Units	NR CA Bandwidth Class			
		B	C	D	
Power in largest transmission bandwidth configuration CC, $P_{largest\ BW}$	dBm	-23^2-TT	-23^2-TT	-25^2-TT	
		-25^3-TT	-25^3-TT	-27^3-TT	
Power in each other CC	dBm	$P_{largest\ BW} + 10*\log\{(N_{RB,c}*SCS_c)/(N_{RB,largest\ BW}*SCS_{largest\ BW})\}$			

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4.
NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.
NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.
NOTE 4: TT for each frequency is specified in Table 7.4A.2.5-3 for each CC.

Table 7.4A.2.5-2: Maximum input level for 3DL CA (Intra-band non-contiguous, Inter-band), per CC

Rx Parameter	Units	Channel bandwidth												
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
Power in Transmission Bandwidth Configuration	dBm	-25[2]-TT				-24[2]-TT	-23[2]-TT	-22[2]-TT	-21[2]-TT	-20[2]-TT				
		-27[3]-TT				-26[3]-TT	-25[3]-TT	-24[3]-TT	-23[3]-TT	-22[3]-TT				

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4.
NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.
NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.
NOTE 4: TT for each frequency is specified in Table 7.4A.2.5-3 for each CC.

Table 7.4A.2.5-3: Test Tolerance (Maximum input level), per CC

f ≤ 3.0GHz	3.0GHz < f ≤6.0GHz
0.7 dB	1.0 dB

7.4A.3 Maximum input level for CA (4DL CA)

7.4A.3.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.4A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.3.4 Test description

7.4A.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state. The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.4A.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.3.4.1-1: Test Configuration Table for 4DL CA

Default Conditions						
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal					
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	NOTE 1					
Test CC Combination setting (NRB_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	NOTE 1, NOTE 5					
Test SCS as specified in Table 5.3.5-1	Lowest for PCC and SCCs					
Network signalling value	NS_01 by default					
Test Parameters						
	Downlink Configuration				**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC1 RB allocation**	**SCC2 RB allocation**	**SCC3 RB allocation**	**CC Mod'n**	**PCC RB allocation**
Default Test Settings for a CA_nXE Configuration (Intra-band contiguous)							
1	CP-OFDM 64QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)							
1	CP-OFDM 64QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXC-nYA-nZA and CA_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band)							
1	CP-OFDM 64QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)							
1	CP-OFDM 64QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intraband non-contiguous)							
1	CP-OFDM 64QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
2	CP-OFDM 256QAM	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1

NOTE 1:	The specific configuration of uplink and downlink are defined in Table 7.3A.3.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for maximum input level testing.
NOTE 2:	CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
NOTE 3:	**Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, X=1, Y =8.
NOTE 4:	In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 5:	If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.4A.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.4A.3.4.3.

7.4A.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1 and C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.2.4.3.

3. SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.4A.3.4.1-1 as appropriate for PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.4A.3.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.4A.3.5-1 and Table 7.4A.3.5-2 according to the type of CA. Send uplink power control commands to the UE using 1dB step size to ensure that the PCC output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.4A.3.5-1 or Table 7.4A.3.5-2 as appropriate for at least the duration of the Throughput measurement ,where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7. Measure the average throughput for the component carrier(s) indicated in table 7.4A.3.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.3.4.2-1.

Table 7.4A.3.4.2-1: Test repetition and measurement configuration

CA configuration	Test ID (NOTE1)	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1.2	1^5	PCC,SCC_1, SCC_2, SCC3	Table 7.4A.3.5-1
Inter-band	1,2	1^2, 2^2, 3^2	SCC1, SCC2, SCC3	Table 7.4A..5-2
Intra-band contiguous + Inter-band	1,2,3	1^3	SCC2, SCC3	Table 7.4A. .5-2
		2^3	SCC1, SCC2, SCC3	Table 7.4A.3.5-1
		3^3	SCC1, SCC2, SCC3	Table 7.4A.3.5-1
Intra-band non-contiguous + Inter-band	1,2,3	1^4	SCC2, SCC3	Table 7.4A.3.5-2
		2^4	SCC1, SCC2, SCC3	Table 7.4A.3.5-2
		3^4	SCC1, SCC2, SCC3	Table 7.4A.3.5-2
Intra-band non-contiguous + Intra-band non-contiguous	1,2	1	SCC2, SCC3	Table 7.4A.3.5-2
		2	SCC2, SCC3	Table 7.4A.3.5-2
NOTE 1: Refers to Test IDs in Table 7.4A.2.4.1-1 NOTE 2: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYA-nZA-nVA Configuration (Inter-band)" in table 7.3A.2.4.1-1. NOTE 3: CA configuration ID as defined in "Default Test Settings for a CA_XC-YA-ZA and CA_XB-YA-ZA Configurations (Intra-band contiguous + Inter-band)" in table 7.3A.2.4.1-1. NOTE 4: CA configuration ID as defined in "Default Test Settings for a CA_nX(2A)-nYA-ZA Configuration (Intra-band non-contiguous + Inter-band)" in table 7.3A.2.4.1-1. NOTE 5: CA configuration ID as defined in "Default Test Settings for a CA_nXE Configuration (Intra-band contiguous)" in table 7.3A.2.4.1-1. NOTE 6: CA configuration ID as defined in "Default Test Settings for a CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)" in table 7.3A.2.4.1-1.				

7.4A.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.4A.3.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.3.5-1 and Table 7.4A.3.5-2 as applicable.

Table 7.4A.3.5-1: Maximum input level for 4DL CA (Intra-band contiguous)

Rx Parameter	Units	NR CA Bandwidth Class			
		B	C	D	
Power in largest transmission bandwidth configuration CC, $P_{largest\ BW}$	dBm	-23^2-TT	-23^2-TT	-25^2-TT	
		-25^3-TT	-25^3-TT	-27^3-TT	
Power in each other CC	dBm	$P_{largest\ BW} + 10*\log\{(N_{RB,c}*SCS_c)/(N_{RB,largest\ BW}*SCS_{largest\ BW})\}$			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4. NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM. NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM. NOTE 4: TT for each frequency is specified in Table 7.4A.3.5-3 for each CC.					

Table 7.4A.3.5-2: Maximum input level for 4DL CA (Intra-band non-contiguous, Inter-band), per CC

Rx Parameter	Units	Channel bandwidth												
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
Power in Transmission Bandwidth Configuration	dBm	-25[2]-TT				-24[2]-TT	-23[2]-TT	-22[2]-TT	-21[2]-TT	-20[2]-TT				
		-27[3]-TT				-26[3]-TT	-25[3]-TT	-24[3]-TT	-23[3]-TT	-22[3]-TT				
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4. NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM. NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM. NOTE 4: TT for each frequency is specified in Table 7.4A.3.5-3 for each CC.														

Table 7.4A.3.5-3: Test Tolerance (Maximum input level), per CC

f ≤ 3.0GHz	3.0GHz < f ≤6.0GHz
0.7 dB	1.0 dB

7.4B Maximum input level for NR-DC

For inter-band NR-DC configurations, the maximum input level for the corresponding inter-band CA configuration as specified in clause 7.4A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.4A.

7.4D Maximum input level for UL MIMO

7.4D.1 Test purpose

Maximum input level tests the ability of UE that supports UL MIMO to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

7.4D.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.4D.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing, the minimum requirements specified in sub-clause 7.4 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.4D and 7.4.

7.4D.4 Test description

7.4D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.4D.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4D.4.1-1: Test Configuration Table

Initial Conditions			
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal	
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range	
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest	
Test SCS as specified in Table 5.3.5-1		Lowest	
Test Parameters for Channel Bandwidths			
Downlink Configuration		**Uplink Configuration**	
Modulation	**RB allocation**	**Modulation**	**RB allocation**
CP-OFDM 64 QAM	NOTE 1	CP-OFDM QPSK	NOTE 2
CP-OFDM 256 QAM	NOTE 1	CP-OFDM QPSK	NOTE 2
NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2. NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected.			

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and DL Reference Measurement Channel is set according to Table 7.4D.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.4D.4.3.

7.4D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.4D.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.4D.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0_1 is specified with condition 2TX_UL_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

3. Set the Downlink signal level to the value defined in Table 7.4D.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.4D.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.4D.4-2-1: Void

7.4D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO

7.4D.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A3.3 with parameters specified in Table 7.4D.5-1.

Table 7.4D.5-1 Maximum input level

Rx Parameter	Units	Channel bandwidth (MHz)		
		5, 10, 15, 20	25, 30, 40, 45, 50	60, 70, 80, 90, 100
Power in Transmission Bandwidth Configuration^{4}	dBm	-25^{2} -TT	$-25 + 10\log_{10}(BW_{Channel}/20)^{Note\ 2}$ -TT	-20^{2} -TT
		$-27^{3,5}$ -TT	$-27 + 10\log_{10}(BW_{Channel}/20)^{Note\ 3,5}$ -TT	$-22^{3,5}$ -TT

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum uplink configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ as defined in clause 6.2.4.
NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.
NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.
NOTE 4: Power in transmission bandwidth configuration value is rounded to the nearest 0.5dB value.
NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM.
NOTE 6: TT for each frequency is specified in Table 7.4D.5-2

Table 7.4D.5-2: Test Tolerance (Maximum input level)

f ≤ 3.0GHz	3.0GHz < f ≤6.0GHz
0.7 dB	1.0 dB

7.5 Adjacent channel selectivity

7.5.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.5.3 Minimum conformance requirements

The UE shall fulfil the minimum requirements specified in Table 7.5.3-1 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and the minimum requirements specified in Table 7.5.3-2. for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz. These requirements apply for all values of an adjacent channel interferer up to -25 dBm and for any SCS specified for the channel bandwidth of the wanted signal. However, it is not possible to directly measure the ACS; instead the lower and upper range of test parameters are chosen as in Table 7.5.3-3 and Table 7.5.3-4 for verification of the requirements specified in Table 7.5.3-1 and as in Table 7.5.3-5, and Table 7.5.3-6 for verification of the requirements specified in Table 7.5.3-2. For these test parameters, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3(with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5). For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.5.3-1: ACS for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
ACS	dB	33	30	27 – 10log$_{10}$(BW$_{Channel}$ /20)
NOTE1: ACS value is rounded to the next higher 0.5dB value				

Table 7.5.3-2: ACS for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
ACS	dB	33

Table 7.5.3-3: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB		
$P_{interferer}$[4]	dBm	REFSENS + 45.5 dB	REFSENS + 42.5 dB	REFSENS + 39.5 – 10log$_{10}$(BW$_{Channel}$ /20)
$BW_{interferer}$	MHz	5		
$F_{interferer}$ (offset)	MHz	BW$_{Channel}$ /2 + 2.5 / -(BW$_{Channel}$ /2 + 2.5)		

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.
NOTE 4: 10log$_{10}$(x) is rounded to the next higher 0.5dB value.

Table 7.5.3-4: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[4]	dBm	-56.5	-53.5	-50.5 + $10\log_{10}(BW_{Channel}/20)$
$P_{interferer}$	dBm	-25		
$BW_{interferer}$	MHz	5		
$F_{interferer}$ (offset)	MHz	$BW_{Channel}/2 + 2.5$ / $-(BW_{Channel}/2 + 2.5)$		

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $(\lceil |F_{interferer}|/SCS \rceil + 0.5)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1
NOTE 4: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.

Table 7.5.3-5: Test parameters for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz, case 1

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB
$P_{interferer}$	dBm	REFSENS + 45.5 dB
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{interferer}$ (offset)	MHz	$BW_{Channel}$ / $-BW_{Channel}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $(\lceil |F_{interferer}|/SCS \rceil + 0.5)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5.3-6: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	-56.5
$P_{interferer}$	dBm	-25
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{interferer}$ (offset)	MHz	$BW_{Channel}$ / $-BW_{Channel}$
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.		

The normative reference for this requirement is TS 38.101-1 [2] clause 7.5.

7.5.4 Test description

7.5.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.5.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range (NOTE 4)			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest, Mid, Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3)			
Test SCS as specified in Table 5.3.5-1	Lowest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5.4.3.

7.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
3. Set the Downlink signal level to the value as defined in Table 7.5.5-2 or Table 7.5.5-5 as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5.5-2 or Table 7.5.5-5 for at least the duration of the Throughput measurement, where:
   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified in Table F.1.3-1.
4. Set the Interferer signal level to the value as defined in Table 7.5.5-2 or Table 7.5.5-5 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.
5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.
6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.
7. Set the Downlink signal level to the value as defined in Table 7.5.5-3 or Table 7.5.5-6 as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5.5-3 or Table 7.5.5-6 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.
8. Set the Interferer signal level to the value as defined in Table 7.5.5-3 or Table 7.5.5-6 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.
9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.
10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.
11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.5.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.5.5 Test requirement

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5.5-2 and 7.5.5-3.

Table 7.5.5-1: ACS for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
ACS	dB	33	30	27 – 10log$_{10}$(BW$_{Channel}$ /20)
NOTE1: ACS value is rounded to the next higher 0.5dB value				

Table 7.5.5-2: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB		
$P_{interferer}$[4]	dBm	REFSENS + 45.5 dB	REFSENS + 42.5 dB	REFSENS + 39.5 – 10log$_{10}$(BW$_{Channel}$ /20)
$BW_{interferer}$	MHz	5		
$F_{interferer}$ (offset)	MHz	BW$_{Channel}$ /2 + 2.5 / -(BW$_{Channel}$ /2 + 2.5)		

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.

NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

NOTE 4: 10log$_{10}$(x) is rounded to the next higher 0.5dB value.

Table 7.5.5-3: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[4]	dBm	-56.5	-53.5	$-50.5 + 10\log_{10}(BW_{Channel}/20)$
$P_{interferer}$	dBm	-25		
$BW_{interferer}$	MHz	5		
$F_{interferer}$ (offset)	MHz	$BW_{Channel}/2 + 2.5$ / $-(BW_{Channel}/2 + 2.5)$		

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1
NOTE 4: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.

For NR bands with $F_{DL\_high} \geq 3300$ MHz and $F_{UL\_high} \geq 3300$ MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1)] with parameters specified in Tables 7.5.5-5 and 7.5.5-6.

Table 7.5.5-4: ACS for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
ACS	dB	33

Table 7.5.5-5: Test parameters for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, case 1

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB
$P_{interferer}$	dBm	REFSENS + 45.5 dB
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{interferer}$ (offset)	MHz	$BW_{Channel}$ / $-BW_{Channel}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5.5-6: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	-56.5
$P_{interferer}$	dBm	-25
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{interferer}$ (offset)	MHz	$BW_{Channel}$ / $-BW_{Channel}$
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \left\lvert F_{\text{interferer}} \right\rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.		

Table 7.5.5-7: Void

7.5A Adjacent channel selectivity for CA

7.5A.0 Minimum conformance requirements

7.5A.0.1 Adjacent channel selectivity for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.5A.0.1-1 and 7.5A.0.1-1a for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.0.1-2, 7.5A.0.1-2a, 7.5A.0.1-3 and 7.5A.0.1-3a.

Table 7.5A.0.1-1: ACS for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

		CA Bandwidth Class		
Rx Parameter	Units	B	C	D
ACS	dB	26.0	33.0	25.2

Table 7.5A.0.1-1a: ACS for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

		CA Bandwidth Class	
Rx Parameter	Units	B	C
ACS	dB	20.0	17.0

Table 7.5A.0.1-2: Test parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

Rx Parameter	Units	CA Bandwidth Class		
		B	C	D
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 24.5 dB	Aggregated power + 31.5 dB	Aggregated power + 23.7 dB
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 -F_{offset}	$BW_{channel\ CA}$ / -$BW_{channel\ CA}$	25 + F_{offset} / -25 -F_{offset}

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.0.1-2a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 1

Rx Parameter	Units	CA Bandwidth Class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 18.5dB	Aggregated power + 15.5dB
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.0.1-3: Test parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

Rx Parameter	Units	CA Bandwidth Class		
		B	C	D
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49.5 + 10log($N_{RB,c}$/N_{RB_agg})	-56.5	-48.7 + 10log($N_{RB,c}$/N_{RB_agg})
$P_{Interferer}$	dBm	-25	-25	-25
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 -F_{offset}	$BW_{channel\ CA}$ / -$BW_{channel\ CA}$	25 + F_{offset} / -25 -F_{offset}

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{\mathrm{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.0.1-3a: Test parameters for intra-band contiguous CA with F_{DL_low} <2700 MHz and F_{UL_low}<2700 MHz, case 2

Rx Parameter	Units	CA Bandwidth Class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	-43.5+ 10log($N_{RB,c}$/N_{RB_agg})	-40.5+ 10log($N_{RB,c}$/N_{RB_agg})
$P_{Interferer}$	dBm	-25	-25
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5+ F_{offset} / -2.5- F_{offset}	2.5+ F_{offset} / -2.5- F_{offset}

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{\mathrm{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

7.5A.0.2 Adjacent channel selectivity Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.3 and 7.5A.0.1 for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power $P_{interferer}$ shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.3-3 and Table 7.5A.0.1-2a for one component carrier and two component carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to $P_{interferer}$ in accordance with the ACS requirement for each sub-block (Table 7.5.3-1 and Table 7.5A.0.1-1a). For the upper range of test parameters (Case 2) for which the interferer power $P_{interferer}$ is -25 dBm (Table 7.5.3-4 and Table 7.5A.0.1-3a) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to $P_{interferer}$ like for Case 1.

For intra-band non-contiguous carrier aggregation with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.3 and 7.5A.0.1 for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power $P_{interferer}$ shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.3-3 and Table 7.5A.0.1-2 for one component carrier and two component carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to $P_{interferer}$ in accordance with the ACS requirement for each sub-block (Table 7.5.3-1 and Table 7.5A.0.1-1). For the upper range of test parameters (Case 2) for which the interferer power $P_{interferer}$ is -25 dBm (Table 7.5.3 and Table 7.5A.0.1-3) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to $P_{interferer}$ like for Case 1.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.5A.0.3 Adjacent channel selectivity Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the adjacent channel requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. For NR CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The UE shall meet the requirements specified in subclause 7.5.3 for each component carrier while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.5A.1 Adjacent channel selectivity for CA (2DL CA)

7.5A.1.1 Test Purpose

Adjacent channel selectivity for 2DL CA verifies the receiver's ability to receive a wanted 2DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 2DL CA.

7.5A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.1.4 Test Description

7.5A.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.5A.1.4.1-1, Table 7.5A.1.4.1-2 or Table 7.5A.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5A.1.4.1-1: Test Configuration Table for intra-band contiguous 2DL CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Mid range		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Lowest N_{RB_agg}, Highest N_{RB_agg} NOTE 3		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested					

Table 7.5A.1.4.1-2: Test Configuration Table for inter-band 2DL CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1, NOTE 3		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg} NOTE 4		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-2. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

Table 7.5A.1.4.1-3: Test Configuration Table for intra-band non-conguous 2DL CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.			NOTE 1, NOTE 3		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5A.1.4.1-1, Table 7.5A.1.4.1-2 or Table 7.5A.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release on according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5A.1.4.3.

7.5A.1.4.2 Test Procedure

1. Intra-band contiguous CA test:

   1.1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

   1.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

   1.3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

   1.4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

   1.5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5A.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

   1.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-2 or 7.5A.1.5-2a as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-2 or Table 7.5A.1.5-2a for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

1.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-2 or 7.5A.1.5-2a as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

1.8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

1.9. Repeat steps from 1.6 to 1.8, using an interfering signal above the wanted signal in Case 1 at step 1.7.

1.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-3 or 7.5A.1.5-3a as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-3 or Table 7.5A.1.5-3a for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

1.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-3 or 7.5A.1.5-3a as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

1.12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

1.13. Repeat steps from 1.10 to 1.12, using an interfering signal above the wanted signal in Case 2 at step 1.11.

1.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

2. Inter-band CA test:

2.1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

2.3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

2.4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

2.5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5A.1.4.1-2. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-5 or 7.5A.1.5-8 as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-5 or Table 7.5A.1.5-8 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

2.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-5 or 7.5A.1.5-8 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

2.8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

2.9. Repeat steps from 2.6 to 2.8, using an interfering signal above the wanted signal in Case 1 at step 2.7.

2.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-6 or 7.5A.1.5-9 as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-6 or Table 7.5A.1.5-9 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

2.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-6 or 7.5A.1.5-9 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

2.12. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

2.13. Repeat steps from 2.10 to 2.12, using an interfering signal above the wanted signal in Case 2 at step 2.11.

2.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

2.15. Repeat steps from 2.1 to 2.14 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, except for operating bands without uplink band.

3. Intra-band non-contiguous CA test:

3.1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

3.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

3.3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

3.4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

3.5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5A.1.4.1-3. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-11 or 7.5A.1.5-14 as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-11 or Table 7.5A.1.5-14 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

3.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-11 or 7.5A.1.5-14 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

3.8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

3.9. Repeat steps from 3.6 to 3.8, using an interfering signal above the wanted signal in Case 1 at step 3.7.

3.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-12 or 7.5A.1.5-15 as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.1.5-6 or Table 7.5A.1.5-9 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

3.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-12 or 7.5A.1.5-15 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

3.12. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

3.13. Repeat steps from 3.10 to 3.12, using an interfering signal above the wanted signal in Case 2 at step 3.11.

3.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.5A.1.4.2-1: Void

7.5A.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.5A.1.5 Test Requirement

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.1.5-2, 7.5A.1.5-2a, 7.5A.1.5-3 and 7.5A.1.5-3a.

Table 7.5A.1.5-1: ACS for intra-band contiguous 2DL CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

		CA Bandwidth Class	
Rx Parameter	**Units**	**B**	**C**
ACS	dB	26.0	33.0

Table 7.5A.1.5-1a: ACS for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

		CA Bandwidth Class	
Rx Parameter	**Units**	**B**	**C**
ACS	dB	20.0	17.0

Table 7.5A.1.5-2: Test parameters for intra-band contiguous 2DL CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

Rx Parameter	Units	CA Bandwidth Class	
		B	**C**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 24.5 dB	Aggregated power + 31.5 dB
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 -F_{offset}	$BW_{channel\ CA}$ / -$BW_{channel\ CA}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.3.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.1.5-2a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 1

Rx Parameter	Units	CA Bandwidth Class	
		B	**C**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 18.5 dB	Aggregated power + 15.5 dB
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.1.5-3: Test parameters for intra-band contiguous 2DL CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

Rx Parameter	Units	CA Bandwidth Class	
		B	**C**

Pw in Transmission Bandwidth Configuration, per CC	dBm	-49.5 + 10log($N_{RB,c}$/N_{RB_agg})	-56.5
$P_{Interferer}$	dBm	-25	-25
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 -F_{offset}	$BW_{channel\ CA}$ / -$BW_{channel\ CA}$
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.3. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.			

Table 7.5A.1.5-3a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 2

Rx Parameter	Units	CA Bandwidth Class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	-43.5+ 10log($N_{RB,c}$/N_{RB_agg})	-40.5+ 10log($N_{RB,c}$/N_{RB_agg})
$P_{Interferer}$	dBm	-25	-25
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5+ F_{offset} / -2.5- F_{offset}	2.5+ F_{offset} / -2.5- F_{offset}
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.			

For NR SCC of inter-band CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1)] with parameters specified in Tables 7.5A.1.5-5 and 7.5A.1.5-6.

Table 7.5A.1.5-4: ACS for NR band with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
ACS	dB	33	33	30	27	26
RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
ACS	dB	25.5	24	23	22.5	21
RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
ACS	dB	20.5	20			

Table 7.5A.1.5-5: Test parameters for NR inter-band CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 42.5 dB	REFSENS for SCC + 39.5 dB	REFSENS for SCC + 38.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 38 dB	REFSENS for SCC + 36.5 dB	REFSENS for SCC + 35.5 dB	REFSENS for SCC + 35 dB	REFSENS for SCC + 33.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 33 dB	REFSENS for SCC + 32.5 dB			
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.1.5-6: Test parameters for NR inter-band CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5	-56.5	-53.5	-50.5	-49.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49	-47	-46.5	-46	-44.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	-44	-43.5			
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

For NR SCC of inter-band CA with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1)] with parameters specified in Tables 7.5A.1.5-8 and 7.5A.1.5-9.

Table 7.5A.1.5-7: ACS for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
ACS	dB	33	33	33	33	33
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
ACS	dB	33	33	33	33	

Table 7.5A.1.5-8: Test parameters for NR inter-band CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.1.5-9: Test parameters for NR inter-band CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25	-25	-25	-25	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \lvert F_{\text{interferer}} \rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

For NR SCC of intra-band non-contiguous CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.5A.1.5-11 and 7.5A.1.5-12.

Table 7.5A.1.5-10: ACS for NR band with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
ACS	dB	33	33	30	27	26
RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
ACS	dB	25.5	24	23	22.5	21
RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
ACS	dB	20.5	20			

Table 7.5A.1.5-11: Test parameters for NR intra-band non-contiguous CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 42.5 dB	REFSENS for SCC + 39.5 dB	REFSENS for SCC + 38.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 38 dB	REFSENS for SCC + 36.5 dB	REFSENS for SCC + 35.5 dB	REFSENS for SCC + 35 dB	REFSENS for SCC + 33.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 33 dB	REFSENS for SCC + 32.5 dB			
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

Table 7.5A.1.5-12: Test parameters for NR intra-band non-contiguous CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5	-56.5	-53.5	-50.5	-49.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15

RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49	-47	-46.5	-46	-44.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5

RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
Pw in Transmission Bandwidth Configuration, per CC	dBm	-44	-43.5			
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

For NR SCC of intra-band non-contiguous CA with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.5A.1.5-14 and 7.5A.1.5-15.

Table 7.5A.1.5-13: ACS for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
ACS	dB	33	33	33	33	33
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
ACS	dB	33	33	33	33	

Table 7.5A.1.5-14: Test parameters for NR intra-band non-contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

RX parameter	Units	Channel bandwidth				
		10 MHz	**15 MHz**	**20 MHz**	**40 MHz**	**50 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.1.5-15: Test parameters for NR intra-band non-contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

RX parameter	Units	Channel bandwidth				
		10 MHz	**15 MHz**	**20 MHz**	**40 MHz**	**50 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25	-25	-25	-25	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

7.5A.2 Adjacent channel selectivity for 3DL CA

7.5A.2.1 Test Purpose

Adjacent channel selectivity for 3DL CA verifies the receiver's ability to receive a wanted 3DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.2.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 3DL CA.

7.5A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.2.4 Test Description

7.5A.2.4.1 Initial Conditions

Same as in clause 7.5A.1.4.1 with following exceptions:

- Instead of Table 7.5A.1.4.1-1→ use Table 7.5A.2.4.1-1.
- Instead of Table 7.5A.1.4.1-2→ use Table 7.5A.2.4.1-1.
- Instead of Table 7.5A.1.4.1-3→ use Table 7.5A.2.4.1-1.

Table 7.5A.2.4.1-1: Test Configuration Table for 3DL CA

Default Conditions						
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal					
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Intra-band contiguous: Mid range for PCC and SCCs Inter-band CA: NOTE 1, NOTE 5 Inter-band + Intra-band contiguous : NOTE 1, NOTE 5 Inter-band + Intra-band non-contiguous : NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1(NOTE 5)					
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	Intra-band contiguous: Lowest N_{RB_agg}, Highest N_{RB_agg} Inter-band: Highest N_{RB_agg} Inter-band + Intra-band contiguous : Highest N_{RB_agg} Inter-band + Intra-band non-contiguous : Highest N_{RB_agg} NOTE 6					
Test SCS as specified in Table 5.3.5-1	Lowest for PCC and SCCs					
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier					
Test Parameters						
	Downlink Configuration				**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC_1 RB allocation**	**SCC_2 RB allocation**	**CC Mod'n**	**PCC RB allocation**
Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)						
1	CP-OFDM QPSK	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)						
1	CP-OFDM QPSK	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations **(Intra-band contiguous + Inter-band)**						
1	CP-OFDM QPSK	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)						
1	CP-OFDM QPSK	NOTE 1	NOTE 1		DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for ACS. NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration. NOTE 3: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, X=1, Y =8 NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.						

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.5A.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.5A.2.4.3.

Table 7.5A.2.4.1-2: Void

Table 7.5A.2.4.1-3: Void

7.5A.2.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5A.2.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5A.2.4.1-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level according to Table 7.5A.2.4.2-1 as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.2.4.2-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7. Set the Interferer signal level to the value as defined in Table 7.5A.2.4.2-1 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

8. Measure the average throughput for the carrier(s) indicated in Table 7.5A.2.4.2-1 for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level according to Table 7.5A.2.4.2-1 as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.2.4.2-1 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

11. Set the Interferer signal level to the value as defined in 7.5A.2.4.2-1 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

12. Measure the average throughput for the carrier(s) indicated in Table 7.5A.2.4.2-1 for a duration sufficient to achieve statistical significance according to Annex H.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.5A.2.4.2-1: Test repetition and measurement configuration

CA configuration	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1[6]	PCC, SCC1, SCC2	7.5A.2.5-1[4] 7.5A.2.5-2[4] 7.5A.2.5-3[4]
Inter-band	1[1] 2[1] 3[1]	SCC1, SCC2	7.5A.2.5-4 7.5A.2.5-5 7.5A.2.5-6 7.5A.2.5-7 7.5A.2.5-8 7.5A.2.5-9
Intra-band contiguous + Inter-band	1[2]	SCC2	7.5A.2.5-4 7.5A.2.5-5 7.5A.2.5-6 7.5A.2.5-7 7.5A.2.5-8 7.5A.2.5-9
	2[2]	SCC1, SCC2	7.5A.2.5-1[5] 7.5A.2.5-1a[5] 7.5A.2.5-2[5] 7.5A.2.5-2a[5] 7.5A.2.5-3[5] 7.5A.2.5-3a[5]
Intra-band non-contiguous + Inter-band	1[3]	SCC2	7.5A.2.5-4 7.5A.2.5-5 7.5A.2.5-6 7.5A.2.5-7 7.5A.2.5-8 7.5A.2.5-9
	2[3]	SCC1, SCC2	7.5A.2.5-4 7.5A.2.5-5 7.5A.2.5-6 7.5A.2.5-7 7.5A.2.5-8 7.5A.2.5-9
NOTE 1: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)" in table 7.3A.2.4.1-1 NOTE 2: CA configuration ID as defined in "Default Test Settings for a CA_nXC-YA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)" in table 7.3A.2.4.1-1. NOTE 3: CA configuration ID as defined in "Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)" in table 7.3A.2.4.1-1. NOTE 4: Test requirements and parameters refer to CA bandwidth D. NOTE 5: Test requirements and parameters refer to CA bandwidth B or C. NOTE 6: CA configuration ID as defined in "Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)" in table 7.3A.2.4.1-1			

7.5A.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.5A.2.5 Test Requirement

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.2.5-2 and 7.5A.2.5-3.

Table 7.5A.2.5-1: ACS for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

		NR CA bandwidth class			
Rx Parameter	Units	B	C	D	
ACS	dB	26.0	33.0	25.2	

Table 7.5A.2.5-1a: ACS for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

		NR CA bandwidth class	
Rx Parameter	Units	B	C
ACS	dB	20.0	17.0

Table 7.5A.2.5-2: Test parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB	REFSENS + 14 dB	
$P_{Interferer}$	dBm	Aggregated power + 24.5 dB	Aggregated power + 31.5 dB	Aggregated power + 23.7 dB	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Interferer}$ (offset)	MHz	10 + Foffset / -10 - Foffset	$BW_{channel\ CA}$ / $-BW_{channel\ CA}$	25 + F_{offset} / -25 -F_{offset}	

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}|/SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.

NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.2.5-2a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 1

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 18.5 dB	Aggregated power + 15.5 dB
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}|/SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.

NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.2.5-3: Test parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49.5 + 10log($N_{RB,c}$/N_{RB_agg})	-56.5	-48.7 + 10log($N_{RB,c}$/N_{RB_agg})	
$P_{Interferer}$	dBm	-25	-25	-25	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 -F_{offset}	$BW_{channel\ CA}$ / -$BW_{channel\ CA}$	25 + F_{offset} / -25 -F_{offset}	

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.2.5-3a: Test parameters for intra-band contiguous CA with F_{DL_low} <2700 MHz and F_{UL_low}<2700 MHz, case 2

Rx Parameter	Units	NR CA Bandwidth Class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	-43.5 + 10log($N_{RB,c}$/N_{RB_agg})	-40.5 + 10log($N_{RB,c}$/N_{RB_agg})
$P_{Interferer}$	dBm	-25	-25
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

For NR SCC of inter-band and intra-band non-contiguous CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.2.5-5 and 7.5A.2.5-6.

Table 7.5A.2.5-4: ACS for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
ACS	dB	33	33	30	27	26
RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
ACS	dB	25.5	24	23	22.5	21
RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
ACS	dB	20.5	20			

Table 7.5A.2.5-5: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 42.5 dB	REFSENS for SCC + 39.5 dB	REFSENS for SCC + 38.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 38 dB	REFSENS for SCC + 36.5 dB	REFSENS for SCC + 35.5 dB	REFSENS for SCC + 35 dB	REFSENS for SCC + 33.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 33 dB	REFSENS for SCC + 32.5 dB			
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.2.5-6: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5	-56.5	-53.5	-50.5	-49.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49	-47	-46.5	-46	-44.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	-44	-43.5			
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

For NR SCC of inter-band and intra-band non-contiguous CA with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.2.5-8 and 7.5A.2.5-9.

Table 7.5A.2.5-7: ACS for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
ACS	dB	33	33	33	33	33
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
ACS	dB	33	33	33	33	

Table 7.5A.2.5-8: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.2.5-9: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25	-25	-25	-25	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

7.5A.3 Adjacent channel selectivity for 4DL CA

Editor's note: - part content of Table 7.5A.3.4.2-1 is FFS.

7.5A.3.1 Test Purpose

Adjacent channel selectivity for 4DL CA verifies the receiver's ability to receive a wanted 4DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.3.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 4DL CA.

7.5A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.3.4 Test Description

7.5A.3.4.1 Initial Conditions

Same as in clause 7.5A.1.4.1 with following exceptions:

- Instead of Table 7.5A.1.4.1-1→ use Table 7.5A.3.4.1-1.
- Instead of Table 7.5A.1.4.1-2→ use Table 7.5A.3.4.1-2.
- Instead of Table 7.5A.1.4.1-3→ use Table 7.5A.3.4.1-3.

Table 7.5A.3.4.1-1: Test Configuration Table for 4DL CA

Default Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Intra-band contiguous: Mid range for PCC and SCCs Inter-band CA: NOTE 1, NOTE 5 Inter-band + Intra-band contiguous : NOTE 1, NOTE 5 Inter-band + Intra-band non-contiguous : NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.3.4.1-1(NOTE 5)
Test CC Combination setting (NRB_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	Intra-band contiguous: Lowest NRB_agg, Highest NRB_agg Inter-band: Highest NRB_agg Inter-band + Intra-band contiguous : Highest NRB_agg Inter-band + Intra-band non-contiguous : Highest NRB_agg NOTE 6
Test SCS as specified in Table 5.3.5-1	Lowest for PCC and SCCs
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier

Test Parameters							
	Downlink Configuration					**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC_1 RB allocation**	**SCC_2 RB allocation**	**SCC_3 RB allocation**	**CC Mod'n**	**PCC RB allocation**
Default Test Settings for a CA_nXE Configuration (intra-band contiguous)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZA-nVA Configuration (Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYB-nZA, CA_nXA-nYA-nZB, CA_nXD-nYA, CA_nXC-nYB, CA_nXC-nYC and CA_nXB-nYB Configurations (Intra-band contiguous + Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZ(2A), CA_nXA-nY(3A) and CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(4A) Configuration intra-band non-contiguous)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1

NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.3.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for ACS.
NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
NOTE 3: **Inter-band:** X,Y,Z,V correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n7A-n28A, X=1, Y=3, Z=7,V=28; **Intra-band contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration, E.g. for CA_n3A-n7B-n28A, X=1,Y=3,z=28; **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n2A-n66A-n77(2A), X=2, Y=66,Z=77；
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.
NOTE 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.

Table 7.5A.3.4.1-2: Void

Table 7.5A.3.4.1-3: Void

7.5A.3.4.2 Test Procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.3.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.5A.3.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5A.3.4.2-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level according to Table 7.5A.3.4.2-1 as appropriate (Case 1). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.3.4.2-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7. Set the Interferer signal level to the value as defined in Table 7.5A.3.4.2-1 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level according to Table 7.5A.3.4.2-1 as appropriate (Case 2). Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5A.3.4.2-1 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

11. Set the Interferer signal level to the value as defined in Table 7.5A.3.4.2-1 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.5A.3.4.2-1: Test repetition and measurement configuration

CA configuration	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1[4]	PCC, SCC1, SCC2,SCC3	TBD
Inter-band	1[1]	TBD	TBD
	2[1]		
	3[1]		
Intra-band contiguous + Inter-band	1[2]	TBD	TBD
	2[2]		
	3[2]		
Intra-band non-contiguous + Inter-band	1[3]	TBD	TBD
	2[3]		
	3[3]		
Intra-band non-contiguous	1[5]	TBD	TBD
NOTE 1: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYA-nZA-nVA Configuration (Inter-band)" in table 7.3A.3.4.1-1. NOTE 2: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYB-nZA, CA_nXA-nYA-nZB, CA_nXD-nYA, CA_nXC-nYB, CA_nXC-nYC and CA_nXB-nYB Configurations (Intra-band contiguous + Inter-band)" in table 7.3A.3.4.1-1. NOTE 3: CA configuration ID as defined in "Default Test Settings for a CA_nXA-nYA-nZ(2A), CA_nXA-nY(3A) and CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Inter-band)" in table 7.3A.3.4.1-1. NOTE 4: CA configuration ID as defined in "Default Test Settings for a CA_nXE Configuration (Intra-band contiguous)" in table 7.3A.3.4.1-1. NOTE 5: CA configuration ID as defined in "Default Test Settings for a CA_nX(4A) Configuration intra-band non-contiguous)" in table 7.3A.3.4.1-1.			

7.5A.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.5A.3.5 Test Requirement

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.3.5-2, 7.5A.3.5-2a, 7.5A.3.5-3, 7.5A.3.5-3a.

Table 7.5A.3.5-1: ACS for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

		NR CA bandwidth class			
Rx Parameter	Units	B	C	D	
ACS	dB	26.0	33.0	25.2	

Table 7.5A.3.5-1a: ACS for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

		NR CA bandwidth class	
Rx Parameter	Units	B	C
ACS	dB	20.0	17.0

Table 7.5A.3.5-2: Test parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	

Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB	REFSENS + 14 dB	
$P_{Interferer}$	dBm	Aggregated power + 24.5 dB	Aggregated power + 31.5 dB	Aggregated power + 23.7 dB	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Interferer}$ (offset)	MHz	10 + Foffset / -10 - Foffset	$BW_{channel\ CA}$ / $-BW_{channel\ CA}$	25 + F_{offset} / -25 $-F_{offset}$	
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.					

Table 7.5A.3.5-2a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 1

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB	REFSENS + 14 dB
$P_{Interferer}$	dBm	Aggregated power + 18.5 dB	Aggregated power + 15.5 dB
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.			

Table 7.5A.3.5-3: Test parameters for intra-band contiguous CA with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz, case 2

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49.5 + 10log($N_{RB,c}$/N_{RB_agg})	-56.5	-48.7 + 10log($N_{RB,c}$/N_{RB_agg})	
$P_{Interferer}$	dBm	-25	-25	-25	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Interferer}$ (offset)	MHz	10 + F_{offset} / -10 $-F_{offset}$	$BW_{channel\ CA}$ / $-BW_{channel\ CA}$	25 + F_{offset} / -25 $-F_{offset}$	
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.					

Table 7.5A.3.5-3a: Test parameters for intra-band contiguous CA with F_{DL_low}<2700 MHz and F_{UL_low}<2700 MHz, case 2

Rx Parameter	Units	NR CA Bandwidth Class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	-43.5 + 10log($N_{RB,c}$/N_{RB_agg})	-40.5 + 10log($N_{RB,c}$/N_{RB_agg})
$P_{Interferer}$	dBm	-25	-25
$BW_{Interferer}$	MHz	5	5
$F_{Interferer}$ (offset)	MHz	2.5 + F_{offset} / -2.5 - F_{offset}	2.5 + F_{offset} / -2.5 - F_{offset}
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{\text{interferer}} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.			

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.3.5-5 and 7.5A.3.5-6.

Table 7.5A.3.5-4: ACS for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
ACS	dB	33	33	30	27	26
RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
ACS	dB	25.5	24	23	22.5	21
RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
ACS	dB	20.5	20			

Table 7.5A.3.5-5: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 1 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 42.5 dB	REFSENS for SCC + 39.5 dB	REFSENS for SCC + 38.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 38 dB	REFSENS for SCC + 36.5 dB	REFSENS for SCC + 35.5 dB	REFSENS for SCC + 35 dB	REFSENS for SCC + 33.5 dB
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 33 dB	REFSENS for SCC + 32.5 dB			
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 3: The interferer consists of the NR interferer RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.3.5-6: Test parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, case 2 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5	-56.5	-53.5	-50.5	-49.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	5 / -5	7.5 / -7.5	10 / -10	12.5 / -12.5	15 / -15
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Pw in Transmission Bandwidth Configuration, per CC	dBm	-49	-47	-46.5	-46	-44.5
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5	5	5	5
$F_{interferer}$ (offset from SCC)	MHz	17.5 / -17.5	22.5 / -22.5	27.5 / -27.5	32.5 / -32.5	42.5 / -42.5
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Pw in Transmission Bandwidth Configuration, per CC	dBm	-44	-43.5			
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	5	5			
$F_{interferer}$ (offset from SCC)	MHz	47.5 / -47.5	52.5 / -52.5			

NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil |F_{\mathrm{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.3.5-8 and 7.5A.3.5-9.

Table 7.5A.3.5-7: ACS for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
ACS	dB	33	33	33	33	33
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
ACS	dB	33	33	33	33	

Table 7.5A.3.5-8: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 1 (inter-band,intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 14 dB				
$P_{interferer}$	dBm	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	REFSENS for SCC + 45.5 dB	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{\text{interferer}}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.

Table 7.5A.3.5-9: Test parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, case 2 (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{interferer}$ (offset from SCC)	MHz	10 / -10	15 / -15	20 / -20	40 / -40	50 / -50
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Pw in Transmission Bandwidth Configuration, per CC	dBm	-56.5				
$P_{interferer}$	dBm	-25	-25	-25	-25	
$BW_{interferer}$	MHz	60	80	90	100	
$F_{interferer}$ (offset from SCC)	MHz	60 / -60	80 / -80	90 / -90	100 / -100	
NOTE 1: The transmitter shall be set to 24 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \lvert F_{\text{interferer}} \rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

7.5B Adjacent channel selectivity for NR-DC

For inter-band NR-DC configurations, the adjacent channel selectivity for the corresponding inter-band CA configuration as specified in clause 7.5A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.5A.

7.5D Adjacent channel selectivity for UL MIMO

7.5D.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5D.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.5D.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in sub-clause 7.5 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.5D and 7.5.

7.5D.4 Test description

7.5D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.5D.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5D.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid and Highest		
Test SCS as specified in Table 5.3.5-1		Lowest		
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**CP-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2 and 7.3.2.4.1-3 for Downlink and Uplink respectively. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.4 for TE diagram and section A.3.2.3 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.5D.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Loop Function On according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5D.4.3.

7.5D.4.2 Test procedure

Same test procedure as specified in 7.5.2.4.2 with the following exception:

- Instead of Table 7.5.4.1-1, use Table 7.5D.4.1-1 in step 1.
- Step 2: SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.5D.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0_1 is specified with condition 2TX_UL_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

7.5D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO

7.5D.5 Test requirement

Same test requirement as defined in Clause 7.5.5.

7.5F Adjacent channel selectivity

7.5F.1 Adjacent channel selectivity for shared spectrum channel access

Editor's note: This clause is incomplete. The following aspects are either missing or not yet determined:

- Test Configuration Table is FFS

- Message content for NS_53 is FFS

- TP analysis is TBD

- TT for 5.925GHz < f ≤ 7.125GHz is TBD

7.5F.1.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5F.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.5F.1.3 Minimum conformance requirements

Instead of the general ACS requirements specified in clause 7.5, the UE shall fulfil the minimum requirements specified in Table 7.5F.1.3-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.5F.1.3-2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.5F.1.3-1: ACS for shared spectrum channel access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
ACS	dB	24	21	19.2	18

Table 7.5F.1.3-2: Test parameters for shared spectrum channel access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB			
$P_{interferer}$	dBm	REFSENS + 36.5 dB	REFSENS + 33.5 dB	REFSENS + 31.7 dB	REFSENS + 30.5 dB
$BW_{interferer}$	MHz	20			
$F_{interferer}$ (offset)	MHz	20 / -20			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.					

The normative reference for this requirement is TS 38.101-1 [2] clause 7.5F.1.

7.5F.1.4 Test description

7.5F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.5F1..4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5F.1.4.1-1: Test Configuration Table

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1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.5F.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5F.1.4.3.

7.5F.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format [1_1] for C_RNTI to transmit the DL RMC according to Table 7.5F.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format [0_1] for C_RNTI to schedule the UL RMC according to Table 7.5F.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5F.1.5-2. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.5F.1.5-2 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified in Table F.1.3-1.

4. Set the Interferer signal level to the value as defined in Table 7.5F.1.5-2 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.5F.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.5F.1.5 Test requirement

For NR bands under test, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5F.1.5-2.

Table 7.5F.1.5-1: ACS for shared spectrum channel access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
ACS	dB	24	21	19.2	18

Table 7.5F.1.5-2: Test parameters for shared spectrum channel access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + 14 dB			
$P_{interferer}$	dBm	REFSENS + 36.5 dB	REFSENS + 33.5 dB	REFSENS + 31.7 dB	REFSENS + 30.5 dB
$BW_{interferer}$	MHz	20			
$F_{interferer}$ (offset)	MHz	20 / -20			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.					

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

7.6.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

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7.6.2 In-band blocking

7.6.2.1 Test purpose

In band blocking is defined for an unwanted interfering signal falling into the range from 15 MHz below to 15 MHz above the UE receive band, with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, or into an immediately adjacent frequency range up 3CBW below or above the UE receive band, with F_{DL_low} ≥3300 MHz and F_{UL_low} ≥ 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.6.2.3 Minimum conformance requirements

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL signal as described in Annex A.5) with parameters specified in Table 7.6.2.3-1 and Table 7.6.2.3-2. The relative throughput shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.2.3-1: In-band blocking parameters for NR bands with FDL_high < 2700 MHz and FUL_high < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[3]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
$BW_{interferer}$	MHz	5		
$F_{Ioffset, case 1}$	MHz	7.5		
$F_{Ioffset, case 2}$	MHz	12.5		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS. NOTE 3 $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.6.2.3-2: In-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2	Case 3	Case 4
	$P_{interferer}$	dBm	-56	-44	-15	-38
	$F_{interferer}$ (offset)	MHz	$-BW_{Channel}/2 - F_{Ioffset, case 1}$ and $BW_{Channel}/2 + F_{Ioffset, case 1}$	$\leq -BW_{Channel}/2 - F_{Ioffset, case 2}$ and $\geq BW_{Channel}/2 + F_{Ioffset, case 2}$		$-BW_{Channel}/2-11$
n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28,n34, n38,n39, n40, n41, n48[3], n50, n51, n53, n65, n66, n67, n70, n74, n75, n76, n85	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$		
n30	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$		$F_{DL\_low} - 11$
n71	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 12$ to $F_{DL\_high} + 15$	$F_{DL\_low} - 12$	
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{Channel}/2 - F_{Ioffset, case 1}$; b: $BW_{Channel}/2 + F_{Ioffset, case 1}$ NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.						

For NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into an immediately adjacent frequency range up to 3CBW below or above the UE receive band where CBW is the bandwidth of the wanted signal. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.2.3-3 and Table 7.6.2.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.2.3-3: In-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{Ioffset, case 1}$	MHz	(3/2)*$BW_{Channel}$
$F_{Ioffset, case 2}$	MHz	(5/2)*$BW_{Channel}$
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1		

Table 7.6.2.3-4: In-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	-$BW_{Channel}$/2 – $F_{Ioffset, case 1}$ and $BW_{Channel}$/2 + $F_{Ioffset, case 1}$	≤ -$BW_{Channel}$/2 – $F_{Ioffset, case 2}$ and ≥ $BW_{Channel}$/2 + $F_{Ioffset, case 2}$
	$F_{interferer}$		NOTE 2	F_{DL_low} – 3*$BW_{Channel}$ to F_{DL_high} + 3*$BW_{Channel}$
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -$BW_{Channel}$/2 – $F_{Ioffset, case 1}$; b: $BW_{Channel}$/2 + $F_{Ioffset, case 1}$ NOTE 3: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal				

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.2.

7.6.2.4 Test description

7.6.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.2.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range (NOTE 4)		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3)		
Test SCS as specified in Table 5.3.5-1		Lowest		
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	CP-OFDM QPSK	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6.2.4.3.

7.6.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6.2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.2.5-1 and 7.6.2.5-2 or Tables 7.6.2.5-3 and 7.6.2.5-4 as appropriate depending on NR band.

4. Set the downlink signal level according to the table 7.6.2.5-1 or 7.6.2.5-3 as appropriate. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6.2.5-1 or Table 7.6.2.5-3 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW.

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS

38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.
6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.
7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. Interferer frequencies should be chosen starting with an offset nearest to the centre frequency and sweep outwards towards the band edges. In order to ensure that full range is tested for interferer frequency, run last test steps at frequency equal to $F_{Interferer}$ range limit defined at the corresponding band edge.
8. If applicable based on NR band, repeat steps from 3 to 5, using interfering signals in Case 3 at step 3.
9. If applicable based on NR band, repeat steps from 3 to 5, using interfering signals in Case 4 at step 3.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.6.2.5 Test requirement

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.6.2.5-1 and 7.6.2.5-2.

Table 7.6.2.5-1: In-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[3]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
$BW_{interferer}$	MHz	5		
$F_{Ioffset, case 1}$	MHz	7.5		
$F_{Ioffset, case 2}$	MHz	12.5		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS. NOTE 3: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.6.2.5-2: In-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2	Case 3	Case 4
	$P_{interferer}$	dBm	-56	-44	-15	-38
	$F_{interferer}$ (offset)	MHz	$-BW_{Channel}/2 - F_{Ioffset, case 1}$ and $BW_{Channel}/2 + F_{Ioffset, case 1}$	$\leq -BW_{Channel}/2 - F_{Ioffset, case 2}$ and $\geq BW_{Channel}/2 + F_{Ioffset, case 2}$		$-BW_{Channel}/2-11$
n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28,n34, n38,n39, n40, n41, n48[3], n50, n51, n53, n65, n66, n67, n70, n74, n75, n76, n85	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$		
n30	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$		$F_{DL\_low} - 11$
n71	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 12$ to $F_{DL\_high} + 15$	$F_{DL\_low} - 12$	

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{Channel}/2 - F_{Ioffset, case 1}$; b: $BW_{Channel}/2 + F_{Ioffset, case 1}$
NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.

For NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2 and A.3 with parameters specified in Tables 7.6.2.5-3 and 7.6.2.5-4.

Table 7.6.2.5-3: In-band blocking parameters for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz

RX parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB
$BW_{interferer}$	MHz	$BW_{Channel}$
$F_{Ioffset, case 1}$	MHz	$(3/2)*BW_{Channel}$
$F_{Ioffset, case 2}$	MHz	$(5/2)*BW_{Channel}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1

Table 7.6.2.5-4: In-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	$-BW_{Channel}/2 - F_{Ioffset, case 1}$ and $BW_{Channel}/2 + F_{Ioffset, case 1}$	$\leq -BW_{Channel}/2 - F_{Ioffset, case 2}$ and $\geq BW_{Channel}/2 + F_{Ioffset, case 2}$
	$F_{interferer}$		NOTE 2	$F_{DL\_low} - 3{*}BW_{Channel}$ to $F_{DL\_high} + 3{*}BW_{Channel}$
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left\|F_{interferer}\right\| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{Channel}/2 - F_{Ioffset, case 1}$; b: $BW_{Channel}/2 + F_{Ioffset, case 1}$ NOTE 3: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal				

Table 7.6.2.5-5: Void

7.6.3 Out-of-band blocking

7.6.3.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band, with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, or falling outside a frequency range up to $3{*}BW_{Channel}$ below or from $3{*}BW_{Channel}$ above the UE receive band, with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

7.6.3.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.6.3.3 Minimum Conformance Requirements

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.3-1 and Table 7.6.3.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.3.3-1: Out-of-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[2]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.6.3.3-2: Out of-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Range 1	Range 2	Range 3
n1, n2, n3, n5, n7, n8, n12, n14, n20, n24, n25, n26, n30, n28, n34, n38, n39, n40, n41, n48[5], n50, n51, n53[8], n65, n66, n70, n71, n74, n75, n76	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} < -15 or 15 < f – F_{DL_high} < 60	-85 < f – F_{DL_low} ≤ -60 or 60 ≤ f – F_{DL_high} < 85	1 ≤ f ≤ F_{DL_low} – 85 or F_{DL_high} + 85 ≤ f ≤ 12750

NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz.
NOTE 2: For band 51 the F_{DL_high} of band 50 is applied as F_{DL_high} for band 51. For band 50, the F_{DL_low} of band 51 is applied as F_{DL_low} for band 50.
NOTE 3: For band 76 the F_{DL_high} of band 75 is applied as F_{DL_high} for band 76. For band 75, the F_{DL_low} of band 76 is applied as F_{DL_low} for band 75.
NOTE 4: For UEs supporting both bands 38 and 41, the F_{DL_high} and F_{DL_low} of band 41 is applied as F_{DL_high} and F_{DL_low} for band 38.
NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz.
NOTE 6: Void.
NOTE 7: For UE supporting both bands 25 and 70, the F_{DL_high} of band 70 is applied as F_{DL_high} for band 25, and the F_{DL_low} of band 25 is applied as F_{DL_low} for band 70.
NOTE 8: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2580 MHz and $F_{Interferer}$ < 2775 MHz.

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3.3-2, a maximum of

$$\left\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, $BW_{Channel}$ is the bandwidth of the frequency channel in MHz and n = 1,2,3 for SCS = 15,30,60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

For NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range up to 3*$BW_{Channel}$ below or from 3*$BW_{Channel}$ above the UE receive band, where $BW_{Channel}$ is the channel bandwidth. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.3-3 and Table 7.6.3.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.3.3-3: Out-of-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + 9 dB

NOTE: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.

Table 7.6.3.3-4: Out-of-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Range1	Range 2	Range 3
n77, n78 (NOTE 3)	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} ≤ -3*$BW_{Channel}$ or 3*$BW_{Channel}$ ≤ f – F_{DL_high} < 60	-200 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel}$) or F_{DL_high} + MAX(200,3*$BW_{Channel}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	-150 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 150	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel}$) or F_{DL_high} + MAX(150,3*$BW_{Channel}$) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. For $BW_{Channel}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.					

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3.3-4, a maximum of

$$\left\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, $BW_{Channel}$ the bandwidth of the frequency channel in MHz and n = 1,2,3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.3.

7.6.3.4 Test Description

7.6.3.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 7.6.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.3.

Table 7.6.3.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	One frequency chosen arbitrarily from low or high range			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest, Mid, Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3)			
Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508 [5] Annex A, in Figure A.3.1.4.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6.3.4.3.

7.6.3.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3.5-2 or 7.6.3.5-4. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

4. Set the downlink signal level according to the table 7.6.3.5-1 or 7.6.3.5-3. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6.3.5-1 or Table 7.6.3.5-3 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS

38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.6.3.5 Test Requirement

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6.3.5-1 and 7.6.3.5-2.

For NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

Table 7.6.3.5-1: Out-of-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[2]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.6.3.5-2: Out-of-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Range 1	Range 2	Range 3
n1, n2, n3, n5, n7, n8, n12, n14, n20, n24, n25, n26, n28, n30, n34, n38, n39, n40, n41, n48[5], n50, n51, n53[8], n65, n66, n70, n71, n74	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} < -15 or 15 < f – F_{DL_high} < 60	-85 < f – F_{DL_low} ≤ -60 or 60 ≤ f – F_{DL_high} < 85	1 ≤ f ≤ F_{DL_low} – 85 or F_{DL_high} + 85 ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: For band 51 the F_{DL_high} of band 50 is applied as F_{DL_high} for band 51. For band 50, the F_{DL_low} of band 51 is applied as F_{DL_low} for band 50. NOTE 3: For band 76 the F_{DL_high} of band 75 is applied as F_{DL_high} for band 76. For band 75, the F_{DL_low} of band 76 is applied as F_{DL_low} for band 75. NOTE 4: For UEs supporting both bands 38 and 41, the F_{DL_high} and F_{DL_low} of band 41 is applied as F_{DL_high} and F_{DL_low} for band 38. NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. NOTE 6: Void. NOTE 7: For UE supporting both bands 25 and 70, the F_{DL_high} of band 70 is applied as F_{DL_high} for band 25, and the F_{DL_low} of band 25 is applied as F_{DL_low} for band 70. NOTE 8: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2580 MHz and $F_{Interferer}$ < 2775 MHz.					

For NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6.3.5-3 and 7.6.3.5-4.

For NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz, the number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

Table 7.6.3.5-3: Out-of-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + 9 dB
NOTE: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.				

Table 7.6.3.5-4: Out of-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Range1	Range 2	Range 3
n77, n78 (NOTE 3)	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} ≤ -3*$BW_{Channel}$ or 3*$BW_{Channel}$ ≤ f – F_{DL_high} < 60	-200 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel}$) or F_{DL_high} + MAX(200,3*$BW_{Channel}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	-150 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 150	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel}$) or F_{DL_high} + MAX(150,3*$BW_{Channel}$) ≤ f ≤ 12750

NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz.
NOTE 2: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal
NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. For $BW_{Channel}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.
NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.

Table 7.6.3.5-5: Void

7.6.4 Narrow band blocking

7.6.4.1 Test Purpose

Verifies a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other NR Node B transmitters exist (except in the adjacent channels and spurious response).

7.6.4.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.6.4.3 Minimum Conformance Requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.4.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.4.3-1: Narrow Band Blocking

<table>
<tr><th rowspan="2">NR band</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="5">Channel Bandwidth (MHz)</th></tr>
<tr><th>5</th><th>10</th><th>15</th><th>20</th><th>25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100</th></tr>
<tr><td rowspan="5">n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76</td><td rowspan="2">P_w</td><td rowspan="2">dBm</td><td></td><td colspan="4">$P_{REFSENS}$ + channel-bandwidth specific value below</td></tr>
<tr><td>16</td><td>13</td><td>14</td><td>16</td><td>16</td></tr>
<tr><td>P_{uw} (CW)</td><td>dBm</td><td colspan="5">-55</td></tr>
<tr><td>F_{uw} (offset SCS= 15 kHz) [4]</td><td>MHz</td><td colspan="4">$\left(\left\lfloor\frac{\frac{BW_{Channel}}{2}+0.2}{SCS}+0.5\right\rfloor+0.5\right)SCS$</td><td>NA</td></tr>
<tr><td>F_{uw} (offset SCS= 30 kHz)[4]</td><td>MHz</td><td colspan="4">NA</td><td>$\left(\left\lfloor\frac{\frac{BW_{Channel}}{2}+BW_{GB,Channel}}{SCS}+0.5\right\rfloor+0.5\right)SCS$</td></tr>
<tr><td colspan="8">NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4
NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The $P_{REFSENS}$ power level is specified in Table 7.3.2-1 and Table 7.3.2-2 for two and four antenna ports, respectively.
NOTE 4: F_{uw} shall be rounded to half of SCS.</td></tr>
</table>

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.4.

7.6.4.4 Test Description

7.6.4.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 7.6.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.4.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range (NOTE 4)		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid and Highest Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 2)		
Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1		According to CH BW SCS in table 7.6.4.3-1		
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 , and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6.4.4.3.

7.6.4.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6.4.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6.4.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.4.5-1.

4. Set the downlink signal level according to the table 7.6.4.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6.4.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.6.4.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Table 7.6.4.5-1.

Table 7.6.4.5-1: Narrow-band blocking

<table>
<tr><th rowspan="2">NR band</th><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="5">Channel Bandwidth (MHz)</th></tr>
<tr><th>5</th><th>10</th><th>15</th><th>20</th><th>25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100</th></tr>
<tr><td rowspan="5">n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76</td><td rowspan="2">P_w</td><td rowspan="2">dBm</td><td></td><td colspan="4">$P_{REFSENS}$ + channel-bandwidth specific value below</td></tr>
<tr><td>16</td><td>13</td><td>14</td><td>16</td><td>16</td></tr>
<tr><td>P_{uw} (CW)</td><td>dBm</td><td colspan="5">-55</td></tr>
<tr><td>F_{uw} (offset SCS= 15 kHz) [4]</td><td>MHz</td><td colspan="4">$\left(\left\lfloor\frac{\frac{BW_{Channel}}{2}+0.2}{SCS}+0.5\right\rfloor+0.5\right)SS$</td><td>NA</td></tr>
<tr><td>F_{uw} (offset SCS= 30 kHz)[4]</td><td>MHz</td><td colspan="4">NA</td><td>$\left(\left\lfloor\frac{\frac{BW_{Channel}}{2}+BW_{GB,Channel}}{SCS}+0.5\right\rfloor+0.5\right)SCS$</td></tr>
<tr><td colspan="8">NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4
NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3: The $P_{REFSENS}$ power level is specified in Table 7.3.2-1 and Table 7.3.2-2 for two and four antenna ports, respectively.
NOTE 4: F_{uw} shall be rounded to half of SCS.</td></tr>
</table>

Table 7.6.4.5-2 Void

7.6A Blocking characteristics for CA

7.6A.1 General

7.6A.2 Inband blocking for CA

7.6A.2.0 Minimum requirements

7.6A.2.0.1 In-band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.6A.2.0.1-1a for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.6A.2.0.1-1: In-band blocking parameters for intra-band contiguous CA with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz

Rx Parameter	Units	NR CA bandwidth class		
		B	C	D
Pw in Transmission Bandwidth Configuration, per CC	dB	REFSENS + CA bandwidth class specific value below		
		10.0	6	13.8
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50
$F_{Ioffset,\ case\ 1}$	MHz	30	$BW_{channel\ CA}$+ $BW_{channel\ CA}$/2	75
$F_{Ioffset,\ case\ 2}$	MHz	50	$BW_{Interferer}$ + $F_{Ioffset,\ case\ 1}$	125
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1				

Table 7.6A.2.0.1-1a: In-band blocking parameters for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NR CA bandwidth class specific value below	REFSENS + NR CA bandwidth class specific value below
		16.0	19.0
$BW_{Interferer}$	MHz	5	5
$F_{Ioffset,\ case\ 1}$	MHz	7.5	7.5
$F_{Ioffset,\ case\ 2}$	MHz	12.5	12.5
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1			

Table 7.6A.2.0.1-2: In-band blocking for intra-band contiguous CA with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\leq -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\geq BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$
	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 3BW_{channel\ CA}$ to $F_{DL\_high} + 3BW_{channel\ CA}$
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left|F_{interferer}\right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$ NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal				

Table 7.6A.2.0.1-2a: In-band blocking for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2	Case 3
	$P_{interferer}$	dBm	-56	-44	
n66 n41 n48[4] n40	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\le -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\ge BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$	
	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$	
n71	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 12$ to $F_{DL\_high} + 15$	$F_{DL\_low} - 12$

NOTE 1: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$
NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal.
NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A.

7.6A.2.0.2 In-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.3.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.2 and in this subclause for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.6A.2.0.3 In-band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.2 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6.2.3-2 and 7.6.2.3-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

For E-UTRA CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The requirements for the component carrier configured in the operating band without uplink operation are specified in Table 7.6A.2.3-1.

Table 7.6A.2.3-1: In-band blocking parameters for additional NR operating bands for carrier aggregation with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n29	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15
NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$ NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left\lvert F_{\text{interferer}} \right\rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal NOTE 4: CBW denotes the channel bandwidth of the wanted signal				

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.2.

7.6A.2.1 In-band blocking for CA (2DL CA)

7.6A.2.1.1 Test purpose

Inband blocking is defined for an unwanted interfering signal falling into the range from 15 MHz below to 15 MHz above the UE receive band, with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, or into an immediately adjacent frequency range up 3CBW below or above the UE receive band, with F_{DL_high} ≥ 3300 MHz and F_{UL_high} ≥ 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6A.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support 2DL CA.

7.6A.2.1.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.1.4 Test description

7.6A.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2..

Table 7.6A.2.1.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Mid range		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg}, NOTE 1, NOTE 3		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested					

Table 7.6A.2.1.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1, NOTE 3		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg} NOTE 1, NOTE 4		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-2. Only test points verifying non-exceptional REFSENS requirements are used for in-band blocking. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested.					

Table 7.6A.2.1.4.1-3: Test configuration table for Intraband non-contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		NOTE 1			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 1, NOTE 3			
Test SCS as specified in Table 5.3.5-1		Lowest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3. Only test points verifying non-exceptional REFSENS requirements are used for in-band blocking. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6A.2.1.4.3.

7.6A.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Tables 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3 on both SCC and PCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Tables 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. For Intra-band contiguous CA: Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6A.2.1.5.1-1 and 7.6A.2.1.5.1-2 or Tables 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a as appropriate depending on NR band.

For Inter-band CA: Set the parameters of the signal generator for an interfering signal below the SCC's wanted signal in Case 1 according to Tables 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2 or Tables 7.6A.2.1.5.3-1a and 7.6A.2.1.5.3-2a as appropriate depending on NR band.

For Intra-band non-contiguous CA: Set the parameters of the signal generator for an interfering signal below the PCC's wanted signal in Case 1 according to 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2 or Tables 7.6A.2.1.5.3-1a and 7.6A.2.1.5.3-2a as appropriate depending on NR bands as appropriate, excluding frequencies where the interferer centre frequency falls within SCC carrier ±(BW/2 + $F_{Ioffset,case\ 1}$), where BW & offset refer to SCC.

7. Set the downlink signal level on both carriers according to the table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a as appropriate. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. For Intra-band contiguous CA: Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A.

   For Inter-band CA: Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

For Intra-band non-contiguous CA: Measure the average throughput of PCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 6.

10. For Intra-band non-contiguous only: Repeat steps from 6 to 9, using an interfering signal below and above the SCC in Case 1 and measuring SCC instead of PCC in step 8, excluding the frequencies where the interferer centre frequency falls within PCC carrier ±(BW/2 + $F_{Ioffset,case\ 1}$), where BW & offset refer to PCC.

11. Repeat steps from 6 to 10, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

12. Repeat steps from 6 to 10, using interfering signals in Case 3 as applicable at step 6and 9. The ranges of case 3 are covered in steps equal to the interferer bandwidth.

13. For Inter-band CA only: Repeat steps from 1 to 12 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.6A.2.1.5 Test requirement

7.6A.2.1.5.1 Intra-band contiguous 2DL CA

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the

DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.2.1.5.1-1: In-band blocking parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx Parameter	Units	NR CA bandwidth class		
		B	C	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + CA bandwidth class specific value below		
		10.0	6	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	
$F_{Ioffset,\ case\ 1}$	MHz	30	$BW_{channel\ CA}$+ $BW_{channel\ CA}/2$	
$F_{Ioffset,\ case\ 2}$	MHz	50	$BW_{Interferer}$ + $F_{Ioffset,\ case\ 1}$	
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1				

Table 7.6A.2.1.5.1-1a: In-band blocking parameters for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NR CA bandwidth class specific value below	REFSENS + NR CA bandwidth class specific value below
		16.0	19.0
$BW_{Interferer}$	MHz	5	5
$F_{Ioffset,\ case\ 1}$	MHz	7.5	7.5
$F_{Ioffset,\ case\ 2}$	MHz	12.5	12.5
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1			

Table 7.6A.2.1.5.1-2: In-band blocking for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	≤ $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and ≥ $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$
	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 3BW_{channel\ CA}$ to $F_{DL\_high} + 3BW_{channel\ CA}$
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil |F_{interferer}| / SCS \rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$ NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal				

Table 7.6A.2.1.5.1-2a: In-band blocking for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2	Case 3
	$P_{interferer}$	dBm	-56	-44	
n66 n41 n48[4]	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\leq -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\geq BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$	
	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 15$ to $F_{DL\_high} + 15$	
n71	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 12$ to $F_{DL\_high} + 15$	$F_{DL\_low} - 12$
NOTE 1: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \lvert F_{interferer} \rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$ NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A					

7.6A.2.1.5.2 In-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.2. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2.

The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

7.6A.2.1.5.3 In-band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements for each component carrier, when operated as SCell, while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.2.1.5.3-1: In-band blocking parameters for NR bands with FDL_high < 2700 MHz and FUL_high < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below				
	dB	6	6	7	9	10
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below				
	dB	11	12	13	14	15
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below				
	dB	15.5	16			
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS..						

Table 7.6A.2.1.5.3-1a: In-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	**15 MHz**	**20 MHz**	**40 MHz**	**50 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below				
	dB	6				
$BW_{interferer}$	MHz	10	15	20	40	50
$F_{Ioffset, case 1}$	MHz	15	22.5	30	60	75
$F_{Ioffset, case 2}$	MHz	25	37.5	50	100	125
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below				
	dB	6				
$BW_{interferer}$	MHz	60	80	90	100	
$F_{Ioffset, case 1}$	MHz	90	120	135	150	
$F_{Ioffset, case 2}$	MHz	150	200	225	250	
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1.						

Table 7.6A.2.1.5.3-2: In-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2	Case 3
	$P_{interferer}$	dBm	-56	-44	-15
n1, n2, n3, n5, n7, n8, n12, n20, n28, n38, n39, n40, n41, n48[3], n50, n51, n66, n70, n74, n75, n76	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$	
	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15	
n71	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 12 to F_{DL_high} + 15	F_{DL_low} – 12

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A.

Table 7.6A.2.1.5.3-2a: In-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and BW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
	$F_{interferer}$		NOTE 2	F_{DL_low} – 3CBW to F_{DL_high} + 3CBW

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: CBW denotes the channel bandwidth of the wanted signal

Table 7.6A.2.1.5.3-2b: In-band blocking parameters for additional NR operating bands for carrier aggregation with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n29	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15
NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$ NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left| F_{\text{interferer}} \right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal NOTE 4: CBW denotes the channel bandwidth of the wanted signal				

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2-1, $P_{interferer}$ power defined in Table 7.6A.2.1.5.3-2 and 7.6A.2.1.5.3-2a is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2-1.

7.6A.2.2 In-band Blocking for CA (3DL CA)

7.6A.2.2.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6A.2.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support 3DL CA.

7.6A.2.2.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.2.4 Test description

7.6A.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.6A.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.2.2.4.1-1: Test Configuration Table for 3DL CA

<table>
<tr><th colspan="7">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="4">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="4">Intra-band contiguous: Mid range for all CCs
Inter-band: NOTE 1, NOTE 5
Intra-band contiguous + Inter-band: NOTE 1, NOTE 5
Intra-band non-contiguous + Inter-band: NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1 (NOTE 5)</td></tr>
<tr><td colspan="3">Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="4">Highest N_{RB_agg}, NOTE 1, NOTE 6</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="4">Lowest for PCC and SCCs</td></tr>
<tr><td colspan="3">Network signalling value</td><td colspan="4">NS_01
Unless given by Table 7.3.2.3-4 for the band with active uplink carrier</td></tr>
<tr><th colspan="7">Test Parameters</th></tr>
<tr><th></th><th colspan="4">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCC_1 RB allocation</th><th>SCC_2 RB allocation</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><th colspan="7">Default Test Settings for a CA_nXD Configuration (Intra-band contiguous CA)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td colspan="2">NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><th colspan="7">Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td colspan="2">NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="7">Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations
(Intra-band contiguous + Inter-band)</td></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td colspan="2">NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="7">Default Test Settings for a CA_nX(2A)-nYA Configurations
(Intra-band non-contiguous + Inter-band)</td></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td colspan="2">NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="7">NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for in-band blocking testing.
NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.
NOTE 3: Inter-band: X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8; Intra-band contiguous + Inter-band: X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3; Intra-band non-contiguous + Inter-band: X and Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, X=1, Y =8
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.
NOTE 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.</td></tr>
</table>

Table 7.6A.2.2.4.1-2: Void

Table 7.6A.2.2.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and Reference Measurement Channel is set according to Tables 7.6A.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.2.2.4.3.

7.6A.2.2.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.2.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format [1_1] for C_RNTI to transmit the DL RMC according to Tables 7.6A.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3 on both SCC and PCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format [0_1] for C_RNTI to schedule the UL RMC according to Tables 7.6A.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6A.2.2.4.2-1.

7 Set the downlink signal level according to the Table 7.6A.2.2.4.2-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in table 7.6A.2.2.4.2-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8 Measure the average throughput for the carrier(s) indicated in Table 7.6A.2.2.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6A.2.2.4.2-1 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6A.2.2.4.2-1.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.6A.2.2.4.2-1: Test repetition and measurement configuration

CA configuration	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1	PCC, SCC_1, SCC_2	7.6A.2.2.5-3 7.6A.2.2.5-3a 7.6A.2.2.5-4 7.6A.2.2.5-4a
Inter-band	1[1]	SCC1, SCC2	7.6A.2.2.5-1 7.6A.2.2.5-1a 7.6A.2.2.5-1b 7.6A.2.2.5-2 7.6A.2.2.5-2a
	2[1]		
	3[1]		
Intra-band contiguous + Inter-band	1[2]	SCC2	7.6A.2.2.5-1 7.6A.2.2.5-1a 7.6A.2.2.5-1b 7.6A.2.2.5-2 7.6A.2.2.5-2a
	2[2]	SCC1, SCC2	7.6A.2.2.5-3 7.6A.2.2.5-3a 7.6A.2.2.5-4 7.6A.2.2.5-4a
Intra-band non-contiguous + Inter-band	2[3]	SCC2	7.6A.2.2.5-1 7.6A.2.2.5-1a 7.6A.2.2.5-1b 7.6A.2.2.5-2 7.6A.2.2.5-2a
	3[3]	SCC1, SCC2	7.6A.2.2.5-1 7.6A.2.2.5-1a 7.6A.2.2.5-2 7.6A.2.2.5-2a
NOTE 1: CA configuration ID as defined in “Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)” in table 7.3A.2.4.1-1. NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.2.4.1-1. NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)” in table 7.3A.2.4.1-3.			

7.6A.2.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.6A.2.2.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables below, according to the type of CA. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.2.2.5-1: In-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	6	7	9	10
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	11	12	13	14	15
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	15.5	16			
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.						

Table 7.6A.2.2.5-1a: In-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

NR band	Parameter	Unit	Case 1	Case 2	Case 3	Case 4
	$P_{interferer}$	dBm	-56	-44	-15	-38
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$		-CBW/2-11
n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n26, n28,n34, n38,n39, n40, n41, n48[3], n50, n51, n53, n65, n66, n70, n74, n75, n76	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15		
n30	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15		F_{DL_low} – 11
n71	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 12 to F_{DL_high} + 15	F_{DL_low} – 12	

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.

7.6A.2.2.5-1b: In-band blocking for additional NR operating bands for carrier aggregation with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n29	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left|F_{\text{interferer}}\right| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal
NOTE 4: CBW denotes the channel bandwidth of the wanted signal

Table 7.6A.2.2.5-2: In-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	10	15	20	25	30
$F_{Ioffset, case 1}$	MHz	15	22.5	30	37.5	45
$F_{Ioffset, case 2}$	MHz	25	37.5	50	62.5	75
RX parameter	**Units**	**Channel bandwidth**				
		40 MHz	**50 MHz**	**60 MHz**	**70 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	40	50	60	70	80
$F_{Ioffset, case 1}$	MHz	60	75	90	105	120
$F_{Ioffset, case 2}$	MHz	100	125	150	175	200
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	90	100			
$F_{Ioffset, case 1}$	MHz	135	150			
$F_{Ioffset, case 2}$	MHz	225	250			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1						

Table 7.6A.2.2.5-2a: In-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (inter-band, intra-band non-contiguous)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and BW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
	$F_{interferer}$		NOTE 2	F_{DL_low} – 3CBW to F_{DL_high} + 3CBW
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \left\|F_{\text{interferer}}\right\| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$ NOTE 3: CBW denotes the channel bandwidth of the wanted signal				

Table 7.6A.2.2.5-3: In-band blocking parameters with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (intra-band contiguous CA)

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	
Pw in Transmission Bandwidth Configuration, per CC	dB	REFSENS + CA bandwidth class specific value below			
		10.0	6	13.8	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Ioffset,\ case\ 1}$	MHz	30	$BW_{channel\ CA}$+ $BW_{channel\ CA}$/2	75	
$F_{Ioffset,\ case\ 2}$	MHz	50	$BW_{Interferer}$ + $F_{Ioffset,\ case\ 1}$	125	
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1					

Table 7.6A.2.2.5-3a: In-band blocking parameters with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz (intra-band contiguous CA)

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NR CA bandwidth class specific value below	
		16.0	19.0
$BW_{Interferer}$	MHz	5	5
$F_{Ioffset,\ case\ 1}$	MHz	7.5	7.5
$F_{Ioffset,\ case\ 2}$	MHz	12.5	12.5
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1			

Table7.6A.2.2.5-4: In-band blocking with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (intra-band contiguous CA)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	-$BW_{channel\ CA}$/2 –$F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}$/2 +$F_{Ioffset,\ case\ 1}$	≤ -$BW_{channel\ CA}$/2 –$F_{Ioffset,\ case\ 2}$ and ≥ $BW_{channel\ CA}$/2 +$F_{Ioffset,\ case\ 2}$
	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 3$BW_{channel\ CA}$ to F_{DL_high} + 3$BW_{channel\ CA}$
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil \lvert F_{\text{interferer}} \rvert / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -$BW_{channel\ CA}$/2 – $F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}$/2 + $F_{Ioffset,\ case\ 1}$ NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal				

Table 7.6A.2.2.5-4a: In-band blocking with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz (intra-band contiguous CA)

NR band	Parameter	Unit	Case 1	Case 2	Case 3
	$P_{interferer}$	dBm	-56	-44	
n41, n66, n48[4], n40	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\leq -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\geq BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$	
	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15	
n71	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 12 to F_{DL_high} + 15	F_{DL_low} – 12

NOTE 1: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$
NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal
NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A.

For the UE which supports inter-band CA configuration in Table 7.3A.3.2.3-1, $P_{interferer}$ power defined in Table 7.6A.2.2.5-1a and Table 7.6A.2.2.5-2a is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.3.2.3-1.

7.6A.2.3 In-band Blocking for CA (4DL CA)

7.6A.2.3.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6A.2.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support 4DL CA.

7.6A.2.3.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.3.4 Test description

7.6A.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.6A.2.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.2.3.4.1-1: Test Configuration Table for 4DL CA

Default Conditions							
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal						
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	NOTE 1						
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	Highest N_{RB_agg}, NOTE 1, NOTE 5						
Test SCS as specified in Table 5.3.5-1	Lowest for PCC and SCCs						
Network signalling value	NS_01 Unless given by Table 7.3.2.3-4 for the band with active uplink carrier						
Test Parameters							
	Downlink Configuration					**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC1 RB allocation**	**SCC2 RB allocation**	**SCC3 RB allocation**	**CC Mod'n**	**PCC RB allocation**
Default Test Settings for a CA_nXE Configuration (Intra-band contiguous CA)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nXC-nYA-ZA and CA_nXB-nYA-ZA Configurations (Intra-band contiguous + Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nYA-ZA Configurations (Intra-band non-contiguous + Inter-band)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
Default Test Settings for a CA_nX(2A)-nY(2A) Configurations (Intra-band non-contiguous + Intra-band non-contiguous)							
1	CP-OFDM QPSK	NOTE 1	NOTE 1			DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.3.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for in-band blocking testing. NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration. NOTE 3: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA_n1A-n1A-n8A, X=1, Y =8 NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 5: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.							

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and Reference Measurement Channel is set according to Tables 7.6A.2.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.2.2.4.3.

7.6A.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.3.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format [1_1] for C_RNTI to transmit the DL RMC according to Table 7.6A.2.3.4.1-1 on both SCC and PCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format [0_1] for C_RNTI to schedule the UL RMC according to Table 7.6A.2.3.4.1-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6A.2.3.4.2-1.

7 Set the downlink signal level according to the Table 7.6A.2.3.4.2-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in table 7.6A.2.2.4.2-1 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8 Measure the average throughput for the carrier(s) indicated in Table 7.6A.2.3.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6A.2.3.4.2-1 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6A.2.3.4.2-1.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.6A.2.3.4.2-1: Test repetition and measurement configuration

CA configuration	CA configuration ID in REFSENS	Throughput measured on	Table with test parameters to select
Intra-band contiguous	1	PCC, SCC1, SCC2, SCC3	7.6A.2.3.5-3 7.6A.2.3.5-3a 7.6A.2.3.5-4 7.6A.2.3.5-4a
Inter-band	1[1]	SCC1, SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-1b 7.6A.2.3.5-2 7.6A.2.3.5-2a
	2[1]		
	3[1]		
Intra-band contiguous + Inter-band	1[2]	SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-1b 7.6A.2.3.5-2 7.6A.2.3.5-2a
	2[2]	SCC1, SCC2, SCC3	7.6A.2.3.5-3 7.6A.2.3.5-3a 7.6A.2.3.5-4 7.6A.2.3.5-4a
	3[2]	SCC1, SCC2, SCC3	7.6A.2.3.5-3 7.6A.2.3.5-3a 7.6A.2.3.5-4 7.6A.2.3.5-4a
Intra-band non-contiguous + Inter-band	1[3]	SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-1b 7.6A.2.3.5-2 7.6A.2.3.5-2a
	2[3]	SCC1, SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-1b 7.6A.2.3.5-2 7.6A.2.3.5-2a
	3[3]	SCC1, SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-2 7.6A.2.3.5-2a
Intra-band non-contiguous + Intra-band non-contiguous	1[4]	SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-2 7.6A.2.3.5-2a
	2[4]	SCC2, SCC3	7.6A.2.3.5-1 7.6A.2.3.5-1a 7.6A.2.3.5-2 7.6A.2.3.5-2a

NOTE 1: CA configuration ID as defined in “Default Test Settings for a CA_nXA-nYA-nZA-VA Configuration (Inter-band)” in table 7.3A.3.4.1-1.
NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA_XC-YA-ZA and CA_XB-YA-ZA Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.3.4.1-1.
NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)” in table 7.3A.3.4.1-1.
NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)” in table 7.3A.2.4.1-1.

7.6A.2.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.6A.2.3.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables below, according to the type of CA.

Table 7.6A.2.3.5-1: In-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	6	7	9	10
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	11	12	13	14	15
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	15.5	16			
$BW_{interferer}$	MHz	5				
$F_{Ioffset, case 1}$	MHz	7.5				
$F_{Ioffset, case 2}$	MHz	12.5				
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.						

Table 7.6A.2.3.5-1a: In-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band, intra-band non-contiguous)

NR band	Parameter	Unit	Case 1	Case 2	Case 3	Case 4
	$P_{interferer}$	dBm	-56	-44	-15	-38
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$		-CBW/2-11
n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n26, n28,n34, n38,n39, n40, n41, n48[3], n50, n51, n53, n65, n66, n70, n74, n75, n76	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15		
n30	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15		F_{DL_low} – 11
n71	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 12 to F_{DL_high} + 15	F_{DL_low} – 12	

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.

7.6A.2.3.5-1b: In-band blocking for additional NR operating bands for carrier aggregation with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz (inter-band)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n29	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$
NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal
NOTE 4: CBW denotes the channel bandwidth of the wanted signal

Table 7.6A.2.3.5-2: In-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (inter-band, intra-band non-contiguous)

RX parameter	Units	Channel bandwidth				
		10 MHz	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	10	15	20	25	30
$F_{Ioffset, case 1}$	MHz	15	22.5	30	37.5	45
$F_{Ioffset, case 2}$	MHz	25	37.5	50	62.5	75
RX parameter	**Units**	**Channel bandwidth**				
		40 MHz	**50 MHz**	**60 MHz**	**70 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	40	50	60	70	80
$F_{Ioffset, case 1}$	MHz	60	75	90	105	120
$F_{Ioffset, case 2}$	MHz	100	125	150	175	200
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6				
$BW_{interferer}$	MHz	90	100			
$F_{Ioffset, case 1}$	MHz	135	150			
$F_{Ioffset, case 2}$	MHz	225	250			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1						

Table 7.6A.2.3.5-2a: In-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (inter-band, intra-band non-contiguous)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and BW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
	$F_{interferer}$		NOTE 2	F_{DL_low} – 3CBW to F_{DL_high} + 3CBW
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil \lvert F_{\text{interferer}} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$ NOTE 3: CBW denotes the channel bandwidth of the wanted signal				

Table 7.6A.2.3.5-3: In-band blocking parameters with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (intra-band contiguous CA)

Rx Parameter	Units	NR CA bandwidth class			
		B	C	D	
Pw in Transmission Bandwidth Configuration, per CC	dB	REFSENS + CA bandwidth class specific value below			
		10.0	6	13.8	
$BW_{Interferer}$	MHz	20	$BW_{channel\ CA}$	50	
$F_{Ioffset,\ case\ 1}$	MHz	30	$BW_{channel\ CA}$+ $BW_{channel\ CA}$/2	75	
$F_{Ioffset,\ case\ 2}$	MHz	50	$BW_{Interferer}$ + $F_{Ioffset,\ case\ 1}$	125	

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Table 7.6A.2.3.5-3a: In-band blocking parameters with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz (intra-band contiguous CA)

Rx Parameter	Units	NR CA bandwidth class	
		B	C
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NR CA bandwidth class specific value below	
		16.0	19.0
$BW_{Interferer}$	MHz	5	5
$F_{Ioffset,\ case\ 1}$	MHz	7.5	7.5
$F_{Ioffset,\ case\ 2}$	MHz	12.5	12.5

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Table7.6A.2.3.5-4: In-band blocking with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz (intra-band contiguous CA)

NR band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
n77, n78, n79	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\leq -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\geq BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$
	$F_{interferer}$	MHz	NOTE 2	$F_{DL\_low} - 3BW_{channel\ CA}$ to $F_{DL\_high} + 3BW_{channel\ CA}$

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\left\lceil |F_{interferer}| / SCS \right\rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.
NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$
NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal

Table 7.6A.2.3.5-4a: In-band blocking with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz (intra-band contiguous CA)

NR band	Parameter	Unit	Case 1	Case 2	Case 3
	$P_{interferer}$	dBm	-56	-44	
n41, n66, n48[4], n40	$F_{interferer}$ (offset)	MHz	$-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$ and $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$	$\leq -BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 2}$ and $\geq BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 2}$	
	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 15 to F_{DL_high} + 15	
n71	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 12 to F_{DL_high} + 15	F_{DL_low} – 12
NOTE 1: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5\right) SCS$ MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: $-BW_{channel\ CA}/2 - F_{Ioffset,\ case\ 1}$; b: $BW_{channel\ CA}/2 + F_{Ioffset,\ case\ 1}$ NOTE 3: $BW_{channel\ CA}$ denotes the aggregated channel bandwidth of the wanted signal NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A.					

For the UE which supports inter-band CA configuration in Table 7.3A.3.2.3-1, $P_{interferer}$ power defined in Table 7.6A.2.3.5-1a and Table 7.6A.2.3.5-2a is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.3.2.3-1.

7.6A.3 Out-of-band blocking for CA

7.6A.3.0 Minimum conformance requirements

7.6A.3.0.1 Out-of-band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test.

The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6A.3.0.1-1 and Tables 7.6A.3.0.1-2 being on either side of the aggregated signal. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.6A.3.0.1-1: Out-of-band blocking parameters for intra-band contiguous CA

RX parameter	Units	CA bandwidth class			
		B	C	D	
Power in transmission bandwidth configuration	dBm	REFSENS + CA bandwidth class specific value below			
	dB	9	9	9	
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.					

Table 7.6A.3.0.1-2: Out of-band blocking for intra-band contiguous CA

NR band	Parameter	Unit	Range1	Range 2	Range 3
	$P_{interferer}$	dBm	-45	-30	-15
n41, n48[5], n66, n71	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} < -15 or 15 < f – F_{DL_high} < 60	-85 < f – F_{DL_low} ≤ -60 or 60 ≤ f – F_{DL_high} < 85	1 ≤ f ≤ F_{DL_low} – 85 or F_{DL_high} + 85 ≤ f ≤ 12750
n77, n78 (NOTE 3)	$F_{interferer}$ (CW)	MHz	N/A	N/A	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel\_CA}$) or F_{DL_high}+ MAX(200,3*$BW_{Channel\_CA}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	N/A	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel\_CA}$) or F_{DL_high} + MAX(150,3*$BW_{Channel\_CA}$) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel\_CA}$ denotes the aggregated channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel\_CA}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel\_CA}$ from the band edge. For $BW_{Channel\_CA}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel\_CA}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel\_CA}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel\_CA}$ from the band edge. NOTE 5: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz					

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6A.3-2, a maximum of

$$\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\} / \min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, $BW_{Channel}$ is the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7A.1 apply.

7.6A.3.0.2 Out-of-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the out-of-band blocking requirements are defined with the uplink configuration in accordance with table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.3 and 7.6A.3.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.6A.3.0.3 Out-of-band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the out-of-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.3 for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with component carriers in operating bands < 2.7GHz including n48, and for $F_{DL\_Low(j)}$ – 15 MHz ≤ f ≤ $F_{DL\_High(j)}$ + 15 MHz, the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5 and 7.6.2 shall be applied for carrier j. For inter-band carrier aggregation with component carriers in operating bands > 2.7GHz excluding n48, and for $F_{DL\_Low(j)} - 3^* BW_{Channel} \leq f \leq F_{DL\_High(j)} + 3^* BW_{Channel}$, the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5 and 7.6.2 shall be applied for carrier j. $F_{DL\_Low(j)}$ and $F_{DL\_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier j, j = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination. $BW_{Channel}$ denotes the channel bandwidth of the wanted signal component carrier j. If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For inter-band carrier aggregation with uplink assigned to two NR bands, the out-of-band blocking requirements specified in subclause 7.6.3 shall be met with the transmitter power for the uplink set to 7 dB below $P_{CMAX\_L,f,c}$ for each serving cell c.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6.3.3-2 and 7.6.3.3-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.0.3-1, exceptions to the requirement specified in Table 7.6A.3.0.3-2 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

Table 7.6A.3.0.3-1: CA band combination with exceptions allowed

CA band combination
CA_n8-n78
CA_n8-n79
CA_n28-n78

Table 7.6A.3.0.3-2: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\left|f_{Interferer} \pm f_{UL}^{LB} - f_{DL}^{HB}\right| \leq (BW_{UL}^{LB} + BW_{DL}^{HB})/2$, where f_{UL}^{LB} and f_{DL}^{HB} are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. BW_{UL}^{LB} and BW_{DL}^{HB} are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively.		

For all interferer frequency ranges specified in subclause 7.6.3 a maximum of

$$\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor BW_{channel} / 2 \rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, $BW_{Channel}$ the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.3.

7.6A.3.1 Out-of-band blocking for CA (2DL CA)

7.6A.3.1.1 Test purpose

Out-of-band band blocking for CA is defined for an unwanted CW interfering signal falling more than 15 MHz or $3^*BW_{Channel\_CA}$ below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz or 3* $BW_{Channel\_CA}$ below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5A and sub-clause 7.6A.2 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.3.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.6A.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.3.0.

7.6A.3.1.4 Test description

7.6A.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.3.1.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 3			
Test SCS as specified in Table 5.3.5-1		Lowest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.					

Table 7.6A.3.1.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal				
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	NOTE 4				
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Highest N_{RB_agg} NOTE 5				
Test SCS as specified in Table 5.3.5-1	Lowest				
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 4: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1 For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 5: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

Table 7.6A.3.1.4.1-3: Test configuration table for Intra-band non-contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal				
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.	NOTE 1, NOTE 3				
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Highest N_{RB_agg} for PCC and SCC, NOTE 1				
Test SCS as specified in Table 5.3.5-1	Lowest				
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.3.1.4.1-1, Table 7.6A.3.1.4.1-2 or Table 7.6A.3.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.3.1.4.3.

7.6A.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below the SCC's operating band for inter-band CA according to table 7.6A.3.1.5.1-2, 7.6A.3.1.5.3-2 or 7.6A.3.1.5.3-4. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6A.3.1.5.3-2 and 7.6A.3.1.5.3-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.1.5.3-5, exceptions to the requirement specified in Table 7.6A.3.1.5.3-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

7. Set the downlink signal level according to the table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for both carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for at least the duration of the Throughput measurement, where:
   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Record the frequencies for which the throughput doesn't meet the requirements.

10. Repeat steps from 6 to 9, using an interfering signal above the CA Band for intra-band CA, or above the SCC's operating band for inter-band CA at step 6.

11. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 10, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.3.1.5 Test requirement

7.6A.3.1.5.1 Out-of-band blocking for Intra-band contiguous CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.1.5.1-1 and 7.6A.3.1.5.1-2.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed $\lfloor \max\{24,6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor,5\}\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor,5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.1.5.1-1: Out-of-band blocking parameters for intra-band contiguous CA

RX parameter	Units	CA bandwidth class	
		B	C
Power in transmission bandwidth configuration	dBm	REFSENS + CA bandwidth class specific value below	
	dB	9	9
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.			

7.6A.3.1.5.1-2: Out of-band blocking for intra-band contiguous CA

NR band	Parameter	Unit	Range1	Range 2	Range 3
	$P_{interferer}$	dBm	-45	-30	-15
n41, n48[5], n66, n71	$F_{interferer}$ (CW)	MHz	$-60 < f - F_{DL\_low} < -15$ or $15 < f - F_{DL\_high} < 60$	$-85 < f - F_{DL\_low} \leq -60$ or $60 \leq f - F_{DL\_high} < 85$	$1 \leq f \leq F_{DL\_low} - 85$ or $F_{DL\_high} + 85 \leq f \leq 12750$
n77, n78 (NOTE 3)	$F_{interferer}$ (CW)	MHz	N/A	N/A	$1 \leq f \leq F_{DL\_low} - MAX(200,3*BW_{Channel\_CA})$ or $F_{DL\_high} + MAX(200,3*BW_{Channel\_CA}) \leq f \leq 12750$
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	N/A	$1 \leq f \leq F_{DL\_low} - MAX(150,3*BW_{Channel\_CA})$ or $F_{DL\_high} + MAX(150,3*BW_{Channel\_CA}) \leq f \leq 12750$

NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz.
NOTE 2: $BW_{Channel\_CA}$ denotes the aggregated channel bandwidth of the wanted signal
NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel\_CA}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge. For $BW_{Channel\_CA}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge.
NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel\_CA}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge.
NOTE 5: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz
NOTE 6: The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

7.6A.3.1.5.2 Out-of-band blocking for Intra-band non-contiguous CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.1.5.3-1 and 7.6A.3.1.5.3-2 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and Tables 7.6A.3.1.5.3-3 and 7.6A.3.1.5.3-4 for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed $\lfloor \max\{24,6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor,5\}\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor,5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.6A.3.1.5.3 Out-of-band blocking for Inter-band CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of SCC shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.1.5.3-1 and 7.6A.3.1.5.3-2 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and Tables 7.6A.3.1.5.3-3 and 7.6A.3.1.5.3-4 for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed $\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel} / 2 \rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.1.5.3-1: Out-of-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	6	7	9	10
RX parameter	Units	Channel bandwidth				
		30 MHz	40 MHz	50 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	11	12	13	14	15
RX parameter	Units	Channel bandwidth				
		90 MHz	100 MHz			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	15.5	16			
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.1.5.3-2: Out-of-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Range 1	Range 2	Range 3
n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n34, n38, n39, n40, n41, n48[5], n50, n51, n66, n70, n71, n74, n75, n76	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	$-60 < f - F_{DL\_low} < -15$ or $15 < f - F_{DL\_high} < 60$	$-85 < f - F_{DL\_low} \leq -60$ or $60 \leq f - F_{DL\_high} < 85$	$1 \leq f \leq F_{DL\_low} - 85$ or $F_{DL\_high} + 85 \leq f \leq 12750$
NOTE1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: For band 51 the F_{DL_high} of band 50 is applied as F_{DL_high} for band 51. For band 50, the F_{DL_low} of band 51 is applied as F_{DL_low} for band 50. NOTE 3: For band 76 the F_{DL_high} of band 75 is applied as F_{DL_high} for band 76. For band 75, the F_{DL_low} of band 76 is applied as F_{DL_low} for band 75. NOTE 4: For UEs supporting both bands 38 and 41, the F_{DL_high} and F_{DL_low} of band 41 is applied as F_{DL_high} and F_{DL_low} for band 38. NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. NOTE 6: Void. NOTE 7: For UE supporting both bands 25 and 70, the F_{DL_high} of band 70 is applied as F_{DL_high} for band 25, and the F_{DL_low} of band 25 is applied as F_{DL_low} for band 70.					

Table 7.6A.3.1.5.3-3: Out-of-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	7	9	9	9
RX parameter	**Units**	**Channel bandwidth**				
		60 MHz	**80 MHz**	**90 MHz**	**100 MHz**	
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	9	9	9	9	
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.1.5.3-4: Out of-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Range1	Range 2	Range 3
n77, n78 (NOTE 3)	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} ≤ -3*$BW_{Channel}$ or 3*$BW_{Channel}$ ≤ f – F_{DL_high} < 60	-200 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel}$) or F_{DL_high} + MAX(200,3*$BW_{Channel}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	-150 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 150	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel}$) or F_{DL_high} + MAX(150,3*$BW_{Channel}$) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. For $BW_{Channel}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.					

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6A.3.1.5.3-2 and 7.6A.3.1.5.3-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.1.5.3-5, exceptions to the requirement specified in Table 7.6A.3.1.5.3-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

Table 7.6A.3.1.5.3-5: CA band combination with exceptions allowed

CA band combination
CA_n8-n78
CA_n8-n79
CA_n28-n78

Table 7.6A.3.1.5.3-6: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\left|f_{Interferer} \pm f_{UL}^{LB} - f_{DL}^{HB}\right| \leq (BW_{UL}^{LB} + BW_{DL}^{HB})/2$, where f_{UL}^{LB} and f_{DL}^{HB} are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. BW_{UL}^{LB} and BW_{DL}^{HB} are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively.		

7.6A.3.2 Out-of-band blocking for CA (3DL CA)

7.6A.3.2.1 Test purpose

Out-of-band band blocking for CA is defined for an unwanted CW interfering signal falling more than 15 MHz or 3*$BW_{Channel\_CA}$ below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz or 3*$BW_{Channel\_CA}$ below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5A and sub-clause 7.6A.2 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.3.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.6A.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.3.0.

7.6A.3.2.4 Test description

7.6A.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.3.2.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal				
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range				
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.	Highest N_{RB_agg} NOTE 3				
Test SCS as specified in Table 5.3.5-1	Lowest				
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCCs RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.					

Table 7.6A.3.2.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal				
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Inter-band : NOTE 5 Intra-band contiguous + Inter-band: NOTE 5 Intra-band non-contiguous + Inter-band: Max WGap for Intra-band non-contiguous NOTE 5				
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	Highest N_{RB_agg} NOTE 3				
Test SCS as specified in Table 5.3.5-1	Lowest				
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCCs RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 5: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.3.2.4.1-1 or Table 7.6A.3.2.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.3.2.4.3.

7.6A.3.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below each SCC's operating band for inter-band CA according to Table 7.6A.3.2.5.1-2, 7.6A.3.2.5.2-2 or 7.6A.3.2.5.2-4. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6A.3.2.5.2-2 and 7.6A.3.2.5.2-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1. Use the highest $\Delta R_{IB,c}$ among CA bands for $P_{interferer}$ calculation.

For inter-band CA combination listed in Table 7.6A.3.2.5.2-5, exceptions to the requirement specified in Table 7.6A.3.2.5.2-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

7. Set the downlink signal level according to Table 7.6A.3.2.5.1-1, 7.6A.3.2.5.2-1 or 7.6A.3.2.5.2-3 for all carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.3.2.5.1-1, 7.6A.3.2.5.2-1 or 7.6A.3.2.5.2-3 for at least the duration of the Throughput measurement, where:

    - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

    - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCCs simultaneously for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of all carriers simultaneously for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.

10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which $\Delta R_{IB,c}$ is the same as ΔR_{IB} used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use $\Delta R_{IB,c}$ relevant to recorded carrier for $P_{interferer}$ calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.

11. Repeat steps from 6 to 10, using an interfering signal above the CA Band for intra-band CA, or above each SCC's operating band for inter-band CA at step 6.

12. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 11, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.3.2.5 Test requirement

7.6A.3.2.5.1 Out-of-band blocking for Intra-band contiguous CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.2.5.1-1 and 7.6A.3.2.5.1-2.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed $\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel} / 2 \rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.2.5.1-1: Out-of-band blocking parameters for intra-band contiguous CA

RX parameter	Units	CA bandwidth class	
		D	
Power in transmission bandwidth configuration	dBm	REFSENS + CA bandwidth class specific value below	
	dB	9	
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.			

7.6A.3.2.5.1-2: Out of-band blocking for intra-band contiguous CA

NR band	Parameter	Unit	Range1	Range 2	Range 3
	$P_{interferer}$	dBm	-45	-30	-15
n41, n48[5], n66, n71	$F_{interferer}$ (CW)	MHz	$-60 < f - F_{DL\_low} < -15$ or $15 < f - F_{DL\_high} < 60$	$-85 < f - F_{DL\_low} \leq -60$ or $60 \leq f - F_{DL\_high} < 85$	$1 \leq f \leq F_{DL\_low} - 85$ or $F_{DL\_high} + 85 \leq f \leq 12750$
n77, n78 (NOTE 3)	$F_{interferer}$ (CW)	MHz	N/A	N/A	$1 \leq f \leq F_{DL\_low} - MAX(200,3*BW_{Channel\_CA})$ or $F_{DL\_high} + MAX(200,3*BW_{Channel\_CA}) \leq f \leq 12750$
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	N/A	$1 \leq f \leq F_{DL\_low} - MAX(150,3*BW_{Channel\_CA})$ or $F_{DL\_high} + MAX(150,3*BW_{Channel\_CA}) \leq f \leq 12750$
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel\_CA}$ denotes the aggregated channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel\_CA}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge. For $BW_{Channel\_CA}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel\_CA} \geq$ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of $3*BW_{Channel\_CA}$ from the band edge. NOTE 5: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. NOTE 6: The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.					

7.6A.3.2.5.2 Out-of-band blocking for Inter-band CA

Except for the spurious response frequencies recorded in step 9 and step 10 of test procedure, the throughput measurement derived in the test procedure of SCCs shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.2.5.2-1 and 7.6A.3.2.5.2-2 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and Tables 7.6A.3.2.5.2-3 and 7.6A.3.2.5.2-4 for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 and step 10 of test procedure shall not exceed $\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel} / 2 \rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.2.5.2-1: Out-of-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	6	7	9	10
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	11	12	13	14	15
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	15.5	16			
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.2.5.2-2: Out of-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Range 1	Range 2	Range 3
n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n34, n38, n39, n40, n41, n48[5], n50, n51, n66, n70, n71, n74, n75, n76	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} < -15 or 15 < f – F_{DL_high} < 60	-85 < f – F_{DL_low} ≤ -60 or 60 ≤ f – F_{DL_high} < 85	1 ≤ f ≤ F_{DL_low} – 85 or F_{DL_high} + 85 ≤ f ≤ 12750
NOTE1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: For band 51 the F_{DL_high} of band 50 is applied as F_{DL_high} for band 51. For band 50, the F_{DL_low} of band 51 is applied as F_{DL_low} for band 50. NOTE 3: For band 76 the F_{DL_high} of band 75 is applied as F_{DL_high} for band 76. For band 75, the F_{DL_low} of band 76 is applied as F_{DL_low} for band 75. NOTE 4: For UEs supporting both bands 38 and 41, the F_{DL_high} and F_{DL_low} of band 41 is applied as F_{DL_high} and F_{DL_low} for band 38. NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. NOTE 6: Void. NOTE 7: For UE supporting both bands 25 and 70, the F_{DL_high} of band 70 is applied as F_{DL_high} for band 25, and the F_{DL_low} of band 25 is applied as F_{DL_low} for band 70.					

Table 7.6A.3.2.5.2-3: Out-of-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	7	9	9	9
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	9	9	9	9	
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.2.5.2-4: Out of-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Range1	Range 2	Range 3
n77, n78 (NOTE 3)	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} ≤ -3*$BW_{Channel}$ or 3*$BW_{Channel}$ ≤ f – F_{DL_high} < 60	-200 < f – F_{DL_low} ≤ -MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel}$) or F_{DL_high} + MAX(200,3*$BW_{Channel}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	-150 < f – F_{DL_low} ≤ -MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 150	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel}$) or F_{DL_high} + MAX(150,3*$BW_{Channel}$) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. For $BW_{Channel}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.					

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.3.5.1.3-5, $P_{interferer}$ power defined in Table 7.6A.3.2.5.2-2 and 7.6A.3.2.5.2-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.3.5.1.3-1.

For inter-band CA combination listed in Table 7.6A.3.2.5.2-5, exceptions to the requirement specified in Table 7.6A.3.2.5.2-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

Table 7.6A.3.2.5.2-5: CA band combination with exceptions allowed

CA band combination
CA_n8-n78
CA_n8-n79
CA_n28-n78

Table 7.6A.3.2.5.2-6: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\left|f_{Interferer} \pm f_{UL}^{LB} - f_{DL}^{HB}\right| \le (BW_{UL}^{LB} + BW_{DL}^{HB})/2$, where f_{UL}^{LB} and f_{DL}^{HB} are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. BW_{UL}^{LB} and BW_{DL}^{HB} are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively.		

7.6A.3.3 Out-of-band blocking for CA (4DL CA)

7.6A.3.3.1 Test purpose

Out-of-band band blocking for CA is defined for an unwanted CW interfering signal falling more than 15 MHz or $3*BW_{Channel\_CA}$ below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz or $3*BW_{Channel\_CA}$ below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5A and sub-clause 7.6A.2 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.3.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.6A.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.3.0.

7.6A.3.3.4 Test description

7.6A.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.3.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.3.3.4.1-1: Test configuration table for Inter-band CA

Default Conditions	
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Inter-band : NOTE 5 Intra-band contiguous + Inter-band: NOTE 5 Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5) Intra-band non-contiguous + Intra-band non-contiguous: MaxWGap for Intra-band non-contiguous (NOTE 5)
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.	Highest N_{RB_agg} NOTE 3
Test SCS as specified in Table 5.3.5-1	Lowest

Test Parameters					
	Downlink Configuration			Uplink Configuration	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCCs RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]

NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.
NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested.
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 5: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.3.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.3.3.4.3.

7.6A.3.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.3.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.3.3.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.3.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below each SCC's operating band for inter-band CA according to Table 7.6A.3.3.5.1-2 or 7.6A.3.3.5.1-4. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.6A.3.3.5.1-2 and 7.6A.3.3.5.1-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1. Use the highest $\Delta R_{IB,c}$ among CA bands for $P_{interferer}$ calculation.

For inter-band CA combination listed in Table 7.6A.3.3.5.1-5, exceptions to the requirement specified in Table 7.6A.3.3.5.1-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

7. Set the downlink signal level according to the Table 7.6A.3.3.5.1-1, or 7.6A.3.3.5.1-3 for all carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.3.3.5.1-1, or 7.6A.3.3.5.1-3 for at least the duration of the Throughput measurement, where:
   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.
8. Measure the average throughput of SCCs simultaneously for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.
9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.
10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which $\Delta R_{IB,c}$ is the same as ΔR_{IB} used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use $\Delta R_{IB,c}$ relevant to recorded carrier for $P_{interferer}$ calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.
11. Repeat steps from 6 to 10, using an interfering signal above each SCC's operating band for inter-band CA at step 6.
12. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 11, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.3.3.5 Test requirement

7.6A.3.3.5.1 Out-of-band blocking for Inter-band CA

Except for the spurious response frequencies recorded in step 9 and step 10 of test procedure, the throughput measurement derived in the test procedure of SCCs shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern

OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.3.5.1-1 and 7.6A.3.3.5.1-2 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and Tables 7.6A.3.3.5.1-3 and 7.6A.3.3.5.1-4 for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 and step 10 of test procedure shall not exceed $\left\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\right\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.3.5.1-1: Out-of-band blocking parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth				
		5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	6	7	9	10
RX parameter	**Units**	**Channel bandwidth**				
		30 MHz	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	11	12	13	14	15
RX parameter	**Units**	**Channel bandwidth**				
		90 MHz	**100 MHz**			
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	15.5	16			
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.3.5.1-2: Out of-band blocking for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

NR band	Parameter	Unit	Range 1	Range 2	Range 3
n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n34, n38, n39, n40, n41, n50, n51, n66, n70, n71, n74, n75, n76	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} < -15 or 15 < f – F_{DL_high} < 60	-85 < f – F_{DL_low} ≤ -60 or 60 ≤ f – F_{DL_high} < 85	1 ≤ f ≤ F_{DL_low} – 85 or F_{DL_high} + 85 ≤ f ≤ 12750
NOTE1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: For band 51 the F_{DL_high} of band 50 is applied as F_{DL_high} for band 51. For band 50, the F_{DL_low} of band 51 is applied as F_{DL_low} for band 50. NOTE 3: For band 76 the F_{DL_high} of band 75 is applied as F_{DL_high} for band 76. For band 75, the F_{DL_low} of band 76 is applied as F_{DL_low} for band 75. NOTE 4: For UEs supporting both bands 38 and 41, the F_{DL_high} and F_{DL_low} of band 41 is applied as F_{DL_high} and F_{DL_low} for band 38. NOTE 6: Void. NOTE 7: For UE supporting both bands 25 and 70, the F_{DL_high} of band 70 is applied as F_{DL_high} for band 25, and the F_{DL_low} of band 25 is applied as F_{DL_low} for band 70.					

Table 7.6A.3.3.5.1-3: Out-of-band blocking parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth				
		10 MHz	15 MHz	20 MHz	40 MHz	50 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	6	7	9	9	9
RX parameter	Units	Channel bandwidth				
		60 MHz	80 MHz	90 MHz	100 MHz	
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below				
	dB	9	9	9	9	
NOTE: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.						

Table 7.6A.3.3.5.1-4: Out of-band blocking for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

NR band	Parameter	Unit	Range1	Range 2	Range 3
n77, n78 (NOTE 3)	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	-60 < f – F_{DL_low} ≤ -3*$BW_{Channel}$ or 3*$BW_{Channel}$ ≤ f – F_{DL_high} < 60	-200 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*$BW_{Channel}$) or F_{DL_high} + MAX(200,3*$BW_{Channel}$) ≤ f ≤ 12750
n79 (NOTE 4)	$F_{interferer}$ (CW)	MHz	N/A	-150 < f – F_{DL_low} ≤ - MAX(60,3*$BW_{Channel}$) or MAX(60,3*$BW_{Channel}$) ≤ f – F_{DL_high} < 150	1 ≤ f ≤ F_{DL_low} – MAX(150,3*$BW_{Channel}$) or F_{DL_high} + MAX(150,3*$BW_{Channel}$) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 6000 MHz. NOTE 2: $BW_{Channel}$ denotes the channel bandwidth of the wanted signal NOTE 3: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 2700 MHz and $F_{Interferer}$ < 4800 MHz. For $BW_{Channel}$ > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. For $BW_{Channel}$ larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge. NOTE 4: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm, for $F_{Interferer}$ > 3650 MHz and $F_{Interferer}$ < 5750 MHz. For $BW_{Channel}$ ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3*$BW_{Channel}$ from the band edge.					

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.3.5.1.3-5, $P_{interferer}$ power defined in Table 7.6A.3.3.5.1-2 and 7.6A.3.3.5.1-4 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.3.5.1.3-1.

For inter-band CA combination listed in Table 7.6A.3.3.5.1-5, exceptions to the requirement specified in Table 7.6A.3.3.5.1-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

Table 7.6A.3.3.5.1-5: CA band combination with exceptions allowed

CA band combination
CA_n8-n78
CA_n8-n79
CA_n28-n78

Table 7.6A.3.3.5.1-6: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\lvert f_{Interferer} \pm f_{UL}^{LB} - f_{DL}^{HB} \rvert \le (BW_{UL}^{LB} + BW_{DL}^{HB})/2$, where f_{UL}^{LB} and f_{DL}^{HB} are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. BW_{UL}^{LB} and BW_{DL}^{HB} are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively.		

7.6A.4 Narrow band blocking for CA

7.6A.4.0 Minimum conformance requirements

7.6A.4.0.1 Narrow band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation, the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6A.4.0.1-1 with the uplink configuration. For UE(s) supporting one uplink, the uplink configuration of the PCC shall be in accordance with Table 7.3.2.3-3. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.6A.4.0.1-1 being on either side of the aggregated signal. The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.0.1-1.

Table 7.6A.4.0.1-1: Narrow-band blocking for intra-band contiguous CA

NR band	Parameter	Unit	NR CA bandwidth class	
			B	C
n41, n66, n48, n71	P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NA CA Bandwidth Class specific value below	REFSENS + NA CA Bandwidth Class specific value below
			16	16
	P_{uw} (CW)	dBm	-55	-55
	F_{uw} (offset for Δf = 15 kHz, 30 kHz)	MHz	- F_{offset} – 0.2 / + F_{offset} + 0.2	- F_{offset} – 0.2 / + F_{offset} + 0.2
NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. NOTE 3: The PREFSENS power level is specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 for two and four antenna ports, respectively. NOTE 4: The F_{uw} (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer}/0.015+0.5 \rfloor 0.015+0.0075$ MHz to be offset from the sub-carrier raster.				

7.6A.4.0.2 Narrow band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with FDL_low < 2700 MHz and FUL_low < 2700 MHz with one uplink carrier and two or more downlink sub-blocks, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.4 and 7.6A.4.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.6A.4.0.3 Narrow band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the narrow band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.4 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6.4.3-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.4.

7.6A.4.1 Narrow band blocking for CA (2DL CA)

7.6A.4,1.1 Test purpose

Verifies a receiver's ability to receive an NR signal at its assigned CA channel frequencies in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.4.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.6A.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.4.0.

7.6A.4.1.4 Test description

7.6A.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.4.1.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 3			
Test SCS as specified in Table 5.3.5-1		Lowest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]

NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.
NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested.
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.

Table 7.6A.4.1.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		NOTE 4			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 5			
Test SCS as specified in Table 5.3.5-1		Lowest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]

NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.
NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 4: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.
NOTE 5: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.

Table 7.6A.4.1.4.1-3: Test configuration table for Intra-band non-contiguous CA

<table>
<tr><th colspan="6">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">NOTE 1</td></tr>
<tr><td colspan="3">Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="3">Highest N_{RB_agg}
NOTE 1, NOTE 3</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">Lowest</td></tr>
<tr><th colspan="6">Test Parameters</th></tr>
<tr><th></th><th colspan="3">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCC RB allocation</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td>NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="6">NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3.
NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.4.1.4.1-1, Table 7.6A.4.1.4.1-2 or Table 7.6A.4.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.4.1.4.3.

7.6A.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.4.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3 on PCC. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below the SCC's operating band for inter-band CA according to Table 7.6A.4.1.5.1-1 or 7.6A.4.1.5.3-1. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.1.5.3-1is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the downlink signal level for both carriers according to 7.6A.4.1.5.1-1 or 7.6A.1.4.5.3-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.4.1.5.1-1 or 7.6A.1.4.5.3-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above the CA Band for intra-band CA, and between PCC's and SCC's wanted signal for intra-band non-contiguous CA, or above the SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.4.1.5 Test requirement

7.6A.4.1.5.1 Narrow band blocking for Intra-band contiguous CA

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.1.5.1-1.

Table 7.6A.4.1.5.1-1: Narrow-band blocking for intra-band contiguous CA

NR band	Parameter	Unit	NR CA bandwidth class	
			B	C
n41, n48, n66, n71	P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + NA CA Bandwidth Class specific value below	REFSENS + NA CA Bandwidth Class specific value below
			16	16
	P_{uw} (CW)	dBm	-55	-55
	F_{uw} (offset for Δf = 15 kHz, 30 kHz)	MHz	- F_{offset} – 0.2 / + F_{offset} + 0.2	- F_{offset} – 0.2 / + F_{offset} + 0.2

NOTE 1:	The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2:	Reference measurement channel is specified in Annexes A.3.2 and A3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
NOTE 3:	The PREFSENS power level is specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 for two and four antenna ports, respectively.
NOTE 4:	The F_{uw} (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075$ MHz to be offset from the sub-carrier raster.
NOTE 5:	The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

7.6A.4.1.5.2 Narrow band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz with one uplink carrier and two downlink carriers, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. The UE shall meet the requirements for each carrier as specified in subclause 7.6.4 for each component carrier respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.1.5.3-1. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

7.6A.4.1.5.3 Narrow band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the narrow band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink.

The throughput of each carrier, when operated as SCC, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.1.5.3-1. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.4.1.5.3-1: Narrow-band blocking

NR band	Parameter	Unit	Channel Bandwidth											
			5 MHz	**10 MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**80 MHz**	**90 MHz**	**100MHz**
n1, n2, n3, n5, n7, n8, n12, n20, n25 n28, n34, n38, n39, n40, n41, n48, n50, n51, n66, n70, n71, n74, n75, n76	P_w	dBm	$P_{REFSENS}$ + channel-bandwidth specific value below											
			16	13	14	16	16	16	16	16	16	16	16	16
	P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55
	F_{uw} (offset SCS= 15 kHz)	MHz	2.7075	5.2125	7.7025	10.2075	13.0275	15.6075	20.5575	25.7025	NA	NA	NA	NA
	F_{uw} (offset SCS= 30 kHz)	MHz	NA	NA	NA	NA	NA	NA	NA	NA	30.855	40.935	45.915	50.865
NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4 NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.														

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.1.5.3-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7.6A.4.2 Narrow band blocking for CA (3DL CA)

7.6A.4.2.1 Test purpose

Verifies a receiver's ability to receive an NR signal at its assigned CA channel frequencies in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.4.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.6A.4.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.4.0.

7.6A.4.2.4 Test description

7.6A.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.4.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.4.2.4.1-1: Test configuration table for 3DL CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Inter-band : NOTE 5 Intra-band contiguous + Inter-band: NOTE 5 Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5)			
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 3			
Test SCS as specified in Table 5.3.5-1		Lowest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCCs RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1. NOTE 2: Void. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 5: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.4.2.4.1-1 or Table 7.6A.4.2.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.4.2.4.3.

7.6A.4.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.4.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.4.2.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.4.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below each SCC's operating band for inter-band CA according to Table 7.6A.4.2.5.1-1. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.2.5.1-1is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the downlink signal level for all carriers according to Table 7.6A.4.2.5.1-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.4.2.5.1-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above each SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell as per corresponding test IDs defined in Table 7.3A.2.4.1-1 and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.4.2.5 Test requirement

7.6A.4.2.5.1 Narrow band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the narrow band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink.

The throughput of each carrier, when operated as SCC, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.2.5.1-1. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.4.2.5.1-1: Narrow-band blocking

NR band	Parameter	Unit	Channel Bandwidth											
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100MHz
n1, n2, n3, n5, n7, n8, n12, n20, n25 n28, n34, n38, n39, n40, n41, n48, n50, n51, n66, n70, n71, n74, n75, n76	P_w	dBm	$P_{REFSENS}$ + channel-bandwidth specific value below											
			16	13	14	16	16	16	16	16	16	16	16	16
	P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55
	F_{uw} (offset SCS= 15 kHz)	MHz	2.7075	5.2125	7.7025	10.2075	13.0275	15.6075	20.5575	25.7025	NA	NA	NA	NA
	F_{uw} (offset SCS= 30 kHz)	MHz	NA	NA	NA	NA	NA	NA	NA	NA	30.855	40.935	45.915	50.865
NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4 NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.														

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.2.5.1-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7.6A.4.3 Narrow band blocking for CA (4DL CA)

7.6A.4.3.1 Test purpose

Verifies a receiver's ability to receive an NR signal at its assigned CA channel frequencies in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.4.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.6A.4.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.4.0.

7.6A.4.3.4 Test description

7.6A.4.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.4.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.4.3.4.1-1: Test configuration table for 4DL CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Inter-band : NOTE 5 Intra-band contiguous + Inter-band: NOTE 5 Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5) Intra-band non-contiguous + Intra-band non-contiguous: MaxWGap for Intra-band non-contiguous (NOTE 5)		
Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg} NOTE 3		
Test SCS as specified in Table 5.3.5-1			Lowest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCCs RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.3.4.1-1. NOTE 2: Void. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 5: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.4.3.4.1-1 or Table 7.6A.4.3.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.4.3.4.3.

7.6A.4.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.4.3.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6A.4.3.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6A.4.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below each SCC's operating band for inter-band CA according to Table 7.6A.4.3.5.1-1. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.3.5.1-1is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the downlink signal level for all carriers according to Table 7.6A.4.3.5.1-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.4.3.5.1-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above each SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell as per corresponding test IDs defined in Table 7.3A.3.4.1-1 and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.4.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.6A.4.3.5 Test requirement

7.6A.4.3.5.1 Narrow band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the narrow band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink.

The throughput of each carrier, when operated as SCC, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.3.5.1-1. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.4.3.5.1-1: Narrow-band blocking

NR band	Parameter	Unit	Channel Bandwidth											
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100MHz
n1, n2, n3, n5, n7, n8, n12, n20, n25 n28, n34, n38, n39, n40, n41, n50, n51, n66, n70, n71, n74, n75, n76	P_w	dBm	$P_{REFSENS}$ + channel-bandwidth specific value below											
			16	13	14	16	16	16	16	16	16	16	16	16
	P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55
	F_{uw} (offset SCS= 15 kHz)	MHz	2.7075	5.2125	7.7025	10.2075	13.0275	15.6075	20.5575	NA	NA	NA	NA	NA
	F_{uw} (offset SCS= 30 kHz)	MHz	NA	NA	NA	NA	NA	NA	NA	25.7025	30.855	40.935	45.915	50.865
NOTE 1: The transmitter shall be set a 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4 NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.														

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, P_{UW} power defined in Table 7.6A.4.3.5.1-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7.6B Blocking characteristics for NR-DC

For inter-band NR-DC configurations, the blocking characteristics for the corresponding inter-band CA configuration as specified in clause 7.6A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.6A.

7.6C Blocking characteristics for SUL

7.6C.1 General

7.6C.2 In-band blocking for SUL

7.6C.2.1 Test purpose

Same test purpose as in clause 7.6.2.1.

7.6C.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

7.6C.2.3 Minimum conformance requirements

For SUL operation, the in-band blocking requirement for downlink bands specified in clause 7.6.2.3 shall be met.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.2.

7.6C.2.4 Test description

Same test description as specified in clause 7.6.2.4 with following exceptions:

Instead of table 5.3.5-1 → use Table 5.5C-1

Instead of table 7.6.2.4.1-1 → use Table 7.6C.2.4-1.

Table 7.6C.2.4-1: Test Configuration Table

<table>
<tr><th colspan="6">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Mid range for both SUL carrier and Non-SUL carrier</td></tr>
<tr><td colspan="3">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Lowest, Mid, Highest for Non-SUL carrier
For SUL band:
n80: 30 MHz
n81: 20 MHz
n82: 20 MHz
n83: 20 MHz
n84: 20 MHz
n86: 40 MHz
n95: 15 MHz</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">15kHz for SUL carrier and lowest SCS for Non-SUL carrier</td></tr>
<tr><th colspan="6">Test Parameters</th></tr>
<tr><th>Test ID</th><th colspan="2">DL Configuration</th><th>UL Configuration</th><th colspan="2">SUL Configuration</th></tr>
<tr><td></td><th>Mod'n</th><th>RB allocation</th><td rowspan="2">N/A</td><th>Mod'n</th><th>RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB (NOTE 1)</td><td>DFT-s-OFDM QPSK</td><td>REFSENS (NOTE 1)</td></tr>
<tr><td colspan="6">NOTE 1: The specific configuration of SUL and DL are defined in Table 7.3C.2.4.1-1.
NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.
NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.8 for TE diagram and section A.3.2 for UE diagram.
- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3.
- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH_PUCCH_ON_SUL, additionally the following exception shown in Table 7.6C.2.4-2 is considered.

Table 7.6C.2.4-2: *PUSCH-Config*

Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED

Table 7.6C.2.4-3: Void

7.6C.2.5 Test requirement

Same test requirement specified in clause 7.6.2.5 for downlink bands shall be met for in-band blocking testing for SUL.

7.6C.2_1 Inband Blocking for SUL with DL CA

7.6C.2_1.1 Inband Blocking for SUL with 2 DL CA

Editor's Note: No test points defined for Inband Blocking for SULwith inter-band 2 DL CA testing. The testing is covered by 7.6.2 and 7.6C.2.

7.6C.2_1.1.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6C.2_1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands and intra-band contiguous 2DL CA.

7.6C.2_1.1.3 Minimum conformance requirements

For SUL operation with downlink CA, the in-band blocking requirement for downlink bands specified in clause 7.6A.2.0 shall be met.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.2.

7.6C.2_1.1.4 Test description

7.6C.2_1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each SUL configuration, are shown in Table 7.6C.2_1.1.4.1-1 for SUL with intra-band contiguous DL CA or Table 7.6C.2_1.1.4.1-2 for SUL with inter-band DL CA. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6C.2_1.1.4.1-1: Test configuration table for SUL configuration with Intra-band contiguous CA

<table>
<tr><th colspan="7">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="4">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="4">Mid range for both SUL carrier and Non-SUL carrier</td></tr>
<tr><td colspan="3">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="4">Highest N_{RB_agg} for downlink bands
For SUL band:
n80: 30 MHz
n81: 20 MHz
n82: 20 MHz
n83: 20 MHz
n84: 20 MHz
n86: 40 MHz
n95: 15 MHz</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="4">15kHz for SUL carrier and lowest for Non-SUL carrier</td></tr>
<tr><th colspan="7">Test Parameters</th></tr>
<tr><th></th><th colspan="3">Downlink Configuration</th><th>Uplink Configuration</th><th colspan="2">SUL Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCC RB allocation</th><th rowspan="2">N/A</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td>NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 2</td></tr>
<tr><td colspan="7">NOTE 1: The specific downlink configuration is defined in Table 7.3A.1.4.1-1.
NOTE 2: The specific SUL configuration is defined in Table 7.3C.2.4.1-1a.
NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

For SUL configuration with inter-band DL CA: No testing need to be performed since the testing has been covered in test case 7.6.2 and 7.6C.2. For band combination CA_nX_SUL_nY-nZ, test the inband blocking of SUL configuration or NR band as listed in Table 7.6C.2_1.1.4.1-2.

Table 7.6C.2_1.1.4.1-2: Test band combinations and configuration

Band configuration	Verifying in-band blocking of SUL configurations/ NR band	Subtest case	Table with test parameters to select
CA_n1A_SUL_n78A-n80A	SUL_n78-n80	7.6C.2	Table 7.6C.2.4-1
	n1	7.6.2	Table 7.6.2.4.1-1
CA_n1A_SUL_n78A-n84A	SUL_n78-n84	7.6C.2	Table 7.6C.2.4-1
	n1	7.6.2	Table 7.6.2.4.1-1
CA_n3A_SUL_n78A-n80A	SUL_n78-n80	7.6C.2	Table 7.6C.2.4-1
	n3	7.6.2	Table 7.6.2.4.1-1
CA_n28A_SUL_n41A-n83A	SUL_n41-n83	7.6C.2	Table 7.6C.2.4-1
	n28	7.6.2	Table 7.6.2.4.1-1
CA_n28A_SUL_n79A-n83A	SUL_n79A-n83A	7.6C.2	Table 7.6C.2.4-1
	n28	7.6.2	Table 7.6.2.4.1-1

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.10 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3.

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH_PUCCH_ON_SUL, additionally the following exception shown in Table7.6C.2_1.1.4.1-3 is considered.

Table 7.6C.2_1.1.4.1-3: *PUSCH-Config*

Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED

7.6C.2_1.1.4.2 Test procedure

For SUL configuration with intra-band contiguous DL CA:

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6C.2_1.1.4.1.
3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).
4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6C.2_1.1.4.1-1 on both SCC and PCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6C.2_1.1.4.1-1 on SUL. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6A.2.1.5.1-1 and 7.6A.2.1.5.1-2 or Tables 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a as appropriate depending on NR band.
7. Set the downlink signal level on both carriers according to the Table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a as appropriate. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a for at least the duration of the Throughput measurement, where:
   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.
8. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A.
9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 6.
10. Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.
12. Repeat steps from 6 to 10, using interfering signals in Case 3 as applicable at step 6and 9. The ranges of case 3 are covered in steps equal to the interferer bandwidth.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6C.2_1.1.5 Test requirement

Same test requirement specified in 7.6A.2.1.5.1 shall be met for downlink bands for SUL configuration with intra-band contiguous DL CA.

Same test requirement specified in clause 7.6C.2.5 or 7.6.2.5 for each band or band combinations listed in Table 7.6C.2_1.1.4.1-2 shall be met for inband blocking testing for SUL configuration with inter-band DL CA.

7.6C.3 Out-of-band blocking for SUL

7.6C.3.1 Test Purpose

Same test purpose as in clause 7.6.3.1.

7.6C.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

7.6C.3.3 Minimum conformance requirements

For SUL operation, the out-of-band blocking requirement for downlink bands specified in clause 7.6.3 shall be met. For operation band combination listed in Table 7.6C.3.3-1, exceptions to the requirement specified in Table 7.6C.3.3-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3.3-1: SUL operating band combination with exceptions allowed

NR Band combination for SUL
SUL_n78-n81
SUL_n78-n82
SUL_n78-n83
SUL_n79-n81
SUL_n79-n83

Table 7.6C.3.3-2: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\|f_{Interferer} \pm f_{SUL} - f_{DL}\| \le (BW_{SUL} + BW_{DL})/2$, where BW_{SUL} and BW_{DL} are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively.		

For all interferer frequency ranges specified in clause 7.6.3 a maximum of

$$\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor CBW / 2 \rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.3.

7.6C.3.4 Test description

Same test description as specified in clause 7.6.3.4 with following exceptions:

Instead of table 5.3.5-1 → use Table 5.5C-1

Instead of table 7.6.3.4.1-1 → use Table 7.6C.3.4-1.

Table 7.6C.3.4-1: Test Configuration Table

<table>
<tr><th colspan="6">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Mid range for SUL carrier
One frequency chosen arbitrarily from low or high range for Non-SUL carrier</td></tr>
<tr><td colspan="3">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Lowest, Mid, Highest for Non-SUL carrier
For SUL band:
n80: 30 MHz
n81: 20 MHz
n82: 20 MHz
n83: 20 MHz
n84: 20 MHz
n86: 40 MHz
n95: 15 MHz</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">15kHz for SUL carrier and lowest for Non-SUL carrier</td></tr>
<tr><th colspan="6">Test Parameters</th></tr>
<tr><th>Test ID</th><th colspan="2">DL Configuration</th><th>UL Configuration</th><th colspan="2">SUL Configuration</th></tr>
<tr><td></td><th>Mod'n</th><th>RB allocation</th><td rowspan="2">N/A</td><th>Mod'n</th><th>RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB (NOTE 1)</td><td>DFT-s-OFDM QPSK</td><td>REFSENS (NOTE 1)</td></tr>
<tr><td colspan="6">NOTE 1: The specific configuration of SUL and DL are defined in Table 7.3C.2.4.1-1.
NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.
NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.9 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3.

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH_PUCCH_ON_SUL, additionally the following exception shown in Table 7.6C.3.4-2 is considered.

Table 7.6C.3.4-2: *PUSCH-Config*

Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED

Table 7.6C.3.4-3: Void

7.6C.3.5 Test Requirement

For SUL operation, the out-of-band blocking requirement for downlink bands specified in clause 7.6.3.5 shall be met. For operation band combination listed in Table 7.6C.3.5-1, exceptions to the requirement specified in Table 7.6C.3.5-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3.5-1: SUL operating band combination with exceptions allowed

NR Band combination for SUL
SUL_n78-n81
SUL_n78-n82
SUL_n78-n83
SUL_n79-n81
SUL_n79-n83

Table 7.6C.3.5-2: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\lvert f_{Interferer} \pm f_{SUL} - f_{DL} \rvert \le (BW_{SUL} + BW_{DL})/2$, where BW_{SUL} and BW_{DL} are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively.		

For all interferer frequency ranges, a maximum of

$$\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$$

exceptions are allowed for the spurious response frequencies recorded in the final step of test procedure in each assigned frequency channel when measured using a step size of $\min(\lfloor CBW/2 \rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

7.6C.3_1 Out-of-band blocking for SUL with DL CA

7.6C.3_1.1 Out-of-band Blocking for SUL with 2 DL CA

Editor's Note: No test points defined for Out-of-band Blocking for SULwith inter-band 2 DL CA testing. The testing is covered by 7.6.3 and 7.6C.3

7.6C.3_1.1.1 Test purpose

Same test purpose as in clause 7.6.3.1.

7.6C.3_1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands and intra-band contiguous 2DL CA.

7.6C.3_1.1.3 Minimum conformance requirements

For SUL operation with downlink CA, the out-of-band blocking requirement for downlink bands specified in clause 7.6A.3 shall be met. For operation band combination listed in Table 7.6C.3_1.1.3-1, exceptions to the requirement specified in Table 7.6C.3_1.1.3-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3_1.1.3-1: SUL operating band combination with exceptions allowed

NR Band combination for SUL
SUL_n78-n81
SUL_n78-n82
SUL_n78-n83
SUL_n79-n81
SUL_n79-n83

Table7.6C.3_1.1.3-2: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\lvert f_{Interferer} \pm f_{SUL} - f_{DL} \rvert \le (BW_{SUL} + BW_{DL})/2$, where BW_{SUL} and BW_{DL} are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively.		

For all interferer frequency ranges specified in clause 7.6.3 a maximum of

$$\left\lfloor \max\{24, 6 \cdot \lceil n \cdot N_{RB} / 6 \rceil\} / \min\{\lfloor n \cdot N_{RB} / 10 \rfloor, 5\} \right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor BW_{channel} / 2 \rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, $BW_{Channel}$ the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.3.

7.6C.3_1.1.4 Test description

7.6C.3_1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6C.3_1.1.4.1-1 for SUL with intra-band contiguous DL CA or Table 7.6C.3_1.1.4.1-2 for SUL with inter-band DL CA. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6C.3_1.1.4.1-1: Test configuration table for SUL configuration with Intra-band contiguous CA

<table>
<tr><th colspan="8">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="5">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="5">Mid range for SUL carrier
One frequency chosen arbitrarily from low or high range for Non-SUL carrier</td></tr>
<tr><td colspan="3">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="5">Highest N_{RB_agg} for downlink bands
For SUL band:
n80: 30 MHz
n81: 20 MHz
n82: 20 MHz
n83: 20 MHz
n84: 20 MHz
n86: 40 MHz
n95: 15 MHz</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="5">15kHz</td></tr>
<tr><th colspan="8">Test Parameters</th></tr>
<tr><th></th><th colspan="3">Downlink Configuration</th><th>Uplink Configuration</th><th colspan="2">SUL Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCC RB allocation</th><th rowspan="2">N/A</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td>NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 2</td></tr>
<tr><td colspan="8">NOTE 1: The specific downlink configuration is defined in Table 7.3A.1.4.1-1.
NOTE 2: The specific SUL configuration is defined in Table 7.3C.2.4.1-1a.
NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

For SUL configuration with inter-band DL CA: No testing need to be performed since the testing has been covered in test case 7.6.3 and 7.6C.3. For band combination CA_nX_SUL_nY-nZ, test the out-of-band blocking of SUL configuration or NR band as listed in Table 7.6C.3_1.1.4.1-2.

Table 7.6C.3_1.1.4.1-2: Test band combinations and configuration

Band configuration	Verifying out-of-band blocking of SUL configurations/ NR band	Subtest case	Table with test parameters to select
CA_n1A_SUL_n78A-n80A	SUL_n78-n80	7.6C.3	Table 7.6C.3.4-1
	n1	7.6.3	Table 7.6.3.4.1-1
CA_n1A_SUL_n78A-n84A	SUL_n78-n84	7.6C.3	Table 7.6C.3.4-1
	n1	7.6.3	Table 7.6.3.4.1-1
CA_n3A_SUL_n78A-n80A	SUL_n78-n80	7.6C.3	Table 7.6C.3.4-1
	n3	7.6.3	Table 7.6.3.4.1-1
CA_n28A_SUL_n41A-n83A	SUL_n41-n83	7.6C.3	Table 7.6C.3.4-1
	n28	7.6.3	Table 7.6.3.4.1-1
CA_n28A_SUL_n79A-n83A	SUL_n79A-n83A	7.6C.3	Table 7.6C.3.4-1
	n28	7.6.3	Table 7.6.3.4.1-1

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.10 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3.

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND

(RF OR RRM), 4.6.3-14 with condition SUL_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH_PUCCH_ON_SUL, additionally the following exception shown in Table7.6C.3_1.1.4.1-3 is considered.

Table 7.6C.3_1.1.4.1-3: *PUSCH-Config*

Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED

7.6C.3_1.1.4.2 Test procedure

For SUL configuration with intra-band contiguous DL CA:

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.1.4.3.
3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).
4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6C.3_1.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6C.3_1.1.4.1-1 on SUL. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
6. Set the parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below the SCC's operating band for inter-band CA according to Table 7.6A.3.1.5.1-2, 7.6A.3.1.5.3-2 or 7.6A.3.1.5.3-4. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

If CW interferer falls in a gap between $F_{DL\_High(j)}$ and $F_{DL\_Low(j+1)}$ where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

7. Set the downlink signal level according to the Table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for both carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for at least the duration of the Throughput measurement, where:
   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.
8. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.
9. Record the frequencies for which the throughput doesn't meet the requirements.
10. Repeat steps from 6 to 9, using an interfering signal above the CA Band for intra-band CA at step 6.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6C.3_1.1.5 Test requirement

Same test requirement specified in 7.6A.3.1.5.1 shall be met for downlink bands for SUL configuration with intra-band contiguous DL CA with following exception:

Table 7.6C.3_1.1.5-1: SUL operating band combination with exceptions allowed

NR Band combination for SUL
SUL_n78-n81
SUL_n78-n82
SUL_n78-n83
SUL_n79-n81
SUL_n79-n83

Table 7.6C.3_1.1.5-2: Requirement for out-of-band blocking exceptions

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44[1]
NOTE 1: The requirement applies when $\|f_{Interferer} \pm f_{SUL} - f_{DL}\| \leq (BW_{SUL} + BW_{DL})/2$, where BW_{SUL} and BW_{DL} are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively.		

Same test requirement specified in clause 7.6C.3.5 or 7.6.3.5 for each band or band combinations listed in Table 7.6C.3_1.1.4-1 shall be met for out-of-band blocking testing for SUL configuration with inter-band 2DL CA.

7.6D Blocking characteristics for UL MIMO

7.6D.1 General

The blocking characteristic for UL MIMO is a measure of the receiver's ability of an UE that support UL MIMO to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

7.6D.2 In-band blocking for UL MIMO

7.6D.2.1 Test purpose

In-band blocking for UL MIMO is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the receive band of an UE that support UL MIMO, with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, or into the range from 3CBW below to 3CBW above the receive band of an UE that support UL MIMO, with F_{DL_high} < 3300 MHz and F_{UL_high} < 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other g-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.2.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.2.4 Test description

7.6D.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6D.2.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest, Mid, Highest			
Test SCS as specified in Table 5.3.5-1	Lowest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**CP-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.				

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.4 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.6D.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* , Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6D.2.4.3.

7.6D.2.4.2 Test procedure

Same test procedure as specified in 7.6.2.4.2.

7.6D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO.

7.6D.2.5 Test requirement

Same test requirement as specified in 7.6.2.5.

Table 7.6D.2.5-1: Void

7.6D.3 Out-of-band blocking for UL MIMO

7.6D.3.1 Test purpose

Out-of-band blocking for UL MIMO is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the receive band of an UE that support UL MIMO, with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz, or falling more than 3CBW below or above the receive band of an UE that support UL MIMO, with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of out-of-band blocking ability will decrease the coverage area when other g-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6D.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.3.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.3.4 Test description

7.6D.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6D.3.4.1-1: Test Configuration Table

<table>
<tr><th colspan="5">Default Conditions</th></tr>
<tr><td colspan="2">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="2">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">One frequency chosen arbitrarily from low or high range</td></tr>
<tr><td colspan="2">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Lowest, Mid, Highest</td></tr>
<tr><td colspan="2">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">Lowest</td></tr>
<tr><th colspan="5">Test Parameters</th></tr>
<tr><th></th><th colspan="2">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>Mod'n</th><th>RB allocation</th><th>Mod'n</th><th>RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="5">NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1.
NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.5 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.6D.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* , Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6D.3.4.3.

7.6D.3.4.2 Test procedure

Same test procedure as specified in 7.6.3.4.2.

7.6D.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO.

7.6D.3.5 Test requirement

Same test requirement as specified in 7.6.3.5.

Table 7.6D.3.5-1: Void

7.6D.4 Narrow band blocking for UL MIMO

7.6D.4.1 Test purpose

Narrow band blocking for UL MIMO is defined for a receiver's ability of an UE that supports UL MIMO to receive a NR signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of narrow-band blocking ability will decrease the coverage area when other g-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6D.4.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.4.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.4.4 Test description

7.6D.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes

A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6D.4.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest, Mid, Highest			
Test SCS as specified in Table 5.3.5-1	Lowest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**CP-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.				

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.5 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.6D.4.4.1-1.
5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* , Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6D.4.4.3.

7.6D.4.4.2 Test procedure

Same test procedure as specified in 7.6.4.4.2.

7.6D.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO.

7.6D.4.5 Test requirement

Same test requirement as specified in 7.6.4.5.

Table 7.6D.4.5-1: Void

7.6E Blocking characteristics for V2X

7.6E.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

7.6E.2 In-band blocking for V2X

7.6E.2.0 Minimum conformance requirements

7.6E.2.0.1 General

The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annex A.7.2 with parameters specified in Table 7.6E.2.0.1-1 and Table 7.6E.2.0.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.2.0.1-1: In-band blocking parameters for NR V2X

RX parameter	Units	Channel bandwidth			
		10 MHz	20 MHz	30 MHz	40 MHz
Power in transmission bandwidth configuration	dBm	$P_{REFSENS\_V2X}$ + channel bandwidth specific value below			
	dB	6	9	11	12
$BW_{interferer}$	MHz	10			
$F_{Ioffset, case 1}$	MHz	15			
$F_{Ioffset, case 2}$	MHz	25			
NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used.					

Table 7.6E.2.0.1-2: In-band blocking for NR V2X

NR band	Parameter	Unit	Case 1	Case 2
n38, n47	$P_{interferer}$	dBm	-44	-44
	$F_{interferer}$ (offset)	MHz	-BW/2 – $F_{Ioffset, case 1}$ and BW/2 + $F_{Ioffset, case 1}$	≤ -BW/2 – $F_{Ioffset, case 2}$ and ≥ BW/2 + $F_{Ioffset, case 2}$
	$F_{interferer}$	MHz	NOTE 2	F_{DL_low} – 30 to F_{DL_high} + 30
NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band. NOTE 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 – $F_{Ioffset, case 1}$ and b. the carrier frequency +BW/2 + $F_{Ioffset, case 1}$ NOTE 3: $F_{Interferer}$ range values for unwanted modulated interfering signal are interferer centre frequencies NOTE 4: The absolute value of the interferer offset $F_{interferer}$ (offset) shall be further adjusted to $\left(\left\lceil \left|F_{interferer}\right| / SCS \right\rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.				

7.6E.2.0.2 In-band blocking for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.6E.2.0.1 shall apply for the NR sidelink reception in the operating Bands in Table 5.2E.1-1 and the requirements specified in clause 7.6.2 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6E.2.

7.6E.2.1 In-band blocking for V2X / non-concurrent operation

FFS

7.6E.2.2 In-band blocking for V2X / con-current operation

FFS

7.6E.3 Out-of-band blocking for V2X

7.6E.3.0 Minimum conformance requirements

7.6E.3.0.1 General

For NR V2X bands out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 30 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.6E.3.0.1-1 and Table 7.6E.3.0.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.3.0.1-1: Out-of-band blocking parameters for NR V2X

RX parameter	Units	Channel bandwidth			
		10 MHz	20 MHz	30 MHz	40 MHz
Power in transmission bandwidth configuration	dBm	$P_{REFSENS\_V2X}$ + channel bandwidth specific value below			
	dB	6	9	11	12
NOTE: Reference measurement channel is A.7.2.					

Table 7.6E.3.0.1-2: Out of-band blocking for NR V2X

NR band	Parameter	Units	Range 1	Range 2	Range 3
n47	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	F_{DL_low} -30 to F_{DL_low} -60	F_{DL_low} -60 to F_{DL_low} -85	F_{DL_low} -85 to 1 MHz
			F_{DL_high} +30 to F_{DL_high} + 60	F_{DL_high} +60 to F_{DL_high} +85	F_{DL_high} +85 to +12750 MHz
n38	$P_{interferer}$	dBm	-44	-30	-15
	$F_{interferer}$ (CW)	MHz	F_{DL_low} -30 to F_{DL_low} -60	F_{DL_low} -60 to F_{DL_low} -85	F_{DL_low} -85 to 1 MHz
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 4400 MHz.					

7.6E.3.0.2 Out-of-band blocking for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.6E.3.0.1 shall apply for the NR sidelink reception in Band n47 and the requirements specified in clause 7.6.3 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6E.3.

7.6E.3.1 Out-of-band blocking for V2X / non-concurrent operation

FFS

7.6E.3.2 Out-of-band blocking for V2X / con-current operation

FFS

7.6F Blocking characteristics for shared spectrum channel access

7.6F.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

7.6F.2 In-band blocking

7.6F.2.1 In-band blocking for shared spectrum channel access

7.6F.2.1.1 Test purpose

In-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 60 MHz below or above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6F.2.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access..

7.6F.2.1.3 Minimum conformance requirements

In-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 60 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6F.2.1.3-1 and Table 7.6F.2.1.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.2.1.3-1: In-band blocking parameters for shared access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	**40 MHz**	**60 MHz**	**80 MHz**
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below			
	dB	9	12	13.8	15
$BW_{interferer}$	MHz	20			
$F_{Ioffset, case 1}$	MHz	30			
$F_{Ioffset, case 2}$	MHz	≥ 50			

Table 7.6F.2.1.3-2: In-band blocking for shared access bands

Operating band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n46, n96	$F_{interferer}$		NOTE 2	F_{DL_low} – 3*CBW to F_{DL_high} + 3*CBW, NOTE 4
NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $(\lceil \lvert F_{interferer} \rvert / SCS \rceil + 0.5) SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal. NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$ NOTE 3: CBW denotes the channel bandwidth of the wanted signal NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – $F_{Ioffset, case 2}$ and CBW/2 + $F_{Ioffset, case 2}$				

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6F.2.1.

7.6F.2.1.4 Test description

7.6F.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6F.2.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6F.2.1.4.1-1: Test Configuration Table

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1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.6F.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.6.2.4.3.

7.6F.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6F.2.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6F.2.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in according to Tables 7.6F.2.1.5-1 and 7.6F.2.1.5-2.

4. Set the downlink signal level according to the table 7.6F.2.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6F.2.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW.

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6F.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with TRANSFORM_PRECODER_ENABLED condition in Table 4.6.3-118 PUSCH-Config.

7.6F.2.1.5 Test requirement

For shared spectrum channel access band, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.6F.2.1.5-1 and Tables 7.6F.2.1.5-2.

Table 7.6F.2.1.5-1: In-band blocking parameters for shared access bands

<table>
<tr><th rowspan="2">RX parameter</th><th rowspan="2">Units</th><th colspan="4">Channel bandwidth</th></tr>
<tr><th>20 MHz</th><th>40 MHz</th><th>60 MHz</th><th>80 MHz</th></tr>
<tr><td rowspan="2">Power in transmission bandwidth configuration</td><td>dBm</td><td colspan="4">REFSENS + channel bandwidth specific value below</td></tr>
<tr><td>dB</td><td>9</td><td>12</td><td>13.8</td><td>15</td></tr>
<tr><td>$BW_{interferer}$</td><td>MHz</td><td colspan="4">20</td></tr>
<tr><td>$F_{Ioffset, case 1}$</td><td>MHz</td><td colspan="4">30</td></tr>
<tr><td>$F_{Ioffset, case 2}$</td><td>MHz</td><td colspan="4">≥ 50</td></tr>
<tr><td colspan="6">NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause [6.2F.4].
NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1</td></tr>
</table>

Table 7.6F.2.1.5-2: In-band blocking for shared access bands

Operating band	Parameter	Unit	Case 1	Case 2
	$P_{interferer}$	dBm	-56	-44
	$F_{interferer}$ (offset)	MHz	-CBW/2 – $F_{Ioffset, case 1}$ and CBW/2 + $F_{Ioffset, case 1}$	≤ -CBW/2 – $F_{Ioffset, case 2}$ and ≥ CBW/2 + $F_{Ioffset, case 2}$
n46, n96	$F_{interferer}$		NOTE 2	F_{DL_low} – 3*CBW to F_{DL_high} + 3*CBW, NOTE 4

NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to $\left(\lceil |F_{\text{interferer}}| / SCS \rceil + 0.5\right)SCS$ MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.

NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – $F_{Ioffset, case 1}$; b: CBW/2 + $F_{Ioffset, case 1}$

NOTE 3: CBW denotes the channel bandwidth of the wanted signal

NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – $F_{Ioffset, case 2}$ and CBW/2 + $F_{Ioffset, case 2}$

7.6F.2.2 In-band blocking for Intra-band contiguous shared spectrum channel access CA

FFS

7.6F.3 7.6F.3 Out-of-band blocking

7.6F.3.1 Out-of-band blocking for shared spectrum channel access

7.6F.3.1.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, and with the present of CW interfering signal falling outside a frequency range 60 MHz or greater below or above the UE receive band.

7.6F.3.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.6F.3.1.3 Minimum conformance requirements

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 60 MHz or greater below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6F.3.1.3-1 and Table 7.6F.3.1.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.3.1.3-1: Out-of-band blocking parameters for shared access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below			
	dB	9			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.					

Table 7.6F.3.1.3-2: Out of-band blocking for shared access bands

Operating band	Parameter	Unit	Range1	Range 2	Range 3
	$P_{interferer}$	dBm	-44	-30	-15
n46, n96	$F_{interferer}$ (CW)	MHz	N/A	-200 < f – F_{DL_low} ≤ -3*CBW or 3*CBW ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*CBW) or F_{DL_high} + MAX(200,3*CBW) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 4200 MHz. NOTE 2: CBW denotes the channel bandwidth of the wanted signal					

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6F.3.1.3-2, a maximum of

$$\left\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\right\rfloor$$

exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of $\min(\lfloor CBW/2\rfloor, 5)$ MHz with N_{RB} the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7F apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6F.3.1

7.6F.3.1.4 Test description

7.6F.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing are shown in Table 7.6F.3.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.3.

Table 7.6F.3.1.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		One frequency chosen arbitrarily from low or high range		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest		
Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest		
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table Table 7.3F.2.4.1-2 and Table 7.3F.2.4.1-3. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3F.2.5-2) is used in the test requirements.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508 [5] Annex A, in Figure A.3.1.4.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The UL and DL Reference Measurement channels are set according to Table 7.6F.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6F.3.1.4.2.

7.6F.3.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6F.3.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6F.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6F.3.1.5- 2. The frequency step size is $\min(\lfloor BW_{channel}/2 \rfloor, 5)$ MHz.

4. Set the downlink signal level according to Table 7.6F.3.1.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6F.3.1.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6F.3.1.4.2 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.6F.3.1.5 Test Requirement

For NR bands with shared spectrum channel access, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Table 7.6F.3.1.5-1 and Table 7.6F.3.1.5-2.

The number of spurious response frequencies recorded in the final step of test procedure shall not exceed $\lfloor \max\{24, 6\cdot\lceil n\cdot N_{RB}/6\rceil\}/\min\{\lfloor n\cdot N_{RB}/10\rfloor, 5\}\rfloor$ in each assigned frequency channel when measured using a $\min(\lfloor BW_{channel}/2\rfloor, 5)$ MHz step size. For these exceptions the requirements of clause 7.7F Spurious Response are applicable.

Table 7.6F.3.1.5-1: Out-of-band blocking parameters for shared access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below			
	dB	9			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3F.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2F.4.					

Table 7.6F.3.1.5-2: Out of-band blocking for shared access bands

Operating band	Parameter	Unit	Range1	Range 2	Range 3
	$P_{interferer}$	dBm	-44	-30	-15
n46, n96	$F_{interferer}$ (CW)	MHz	N/A	-200 < f – F_{DL_low} ≤ -3*CBW or 3*CBW ≤ f – F_{DL_high} < 200	1 ≤ f ≤ F_{DL_low} – MAX(200,3*CBW) or F_{DL_high} + MAX(200,3*CBW) ≤ f ≤ 12750
NOTE 1: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 4200 MHz. NOTE 2: CBW denotes the channel bandwidth of the wanted signal					

7.7 Spurious response

7.7.1 Test Purpose

Spurious response is a measure of the ability of the receiver to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency for which a response is obtained, i.e. for which the out-of-band blocking limit as specified in subclause 7.6.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.7.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3(with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters for the wanted signal as specified in Table 7.7.3-1 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and in Table 7.7.3-1a for NR bands with F_{DL_high} ≥ 3300 MHz and F_{UL_high} ≥ 3300 MHz and for the interferer as specified in Table 7.7.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.7.3-1: Spurious response parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[2]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.7.3-1a: Spurious response parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + 9 dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.				

Table 7.7.3-2: Spurious response

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7.

7.7.4 Test Description

7.7.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.3.4.1 in order to test spurious responses obtained in clause 7.6.3 under the same conditions.

7.7.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6.3.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.3.4.2.
4. Set the downlink signal level according to the table 7.7.5-1 or 7.7.5-1a. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.7.5-1 or 7.7.5-1a for at least the duration of the Throughput measurement, where:
    - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW
    - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.
5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.7.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.7.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters for the wanted signal as specified in Table 7.7.5-1 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and in Table 7.7.5-1a for NR bands with F_{DL_high} ≥ 3300 MHz and F_{UL_high} ≥ 3300 MHz and for the interferer as specified in Table 7.7.5-2.

Table 7.7.5-1: Spurious response parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration[2]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: 10log10(x) is rounded to the next higher 0.5dB value.				

Table 7.7.5-1a: Spurious response parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

RX parameter	Units	Channel bandwidth (MHz)		
		10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
Power in transmission bandwidth configuration	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + 9 dB
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.				

Table 7.7.5-2: Spurious response

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

Table 7.7.5-3: Void

7.7A Spurious response for CA

7.7A.0 Minimum conformance requirements

7.7A.0.1 Minimum conformance requirements for intra-band contiguous CA

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7A.1.

Table 7.7A.0.1-1: Spurious response parameters for intra-band contiguous CA

RX parameter	Units	BW Class		
		B	C	D
Power in transmission bandwidth configuration	dBm	REFSENS + channel specific value below		
	dB	9	9	9
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.				

Table 7.7A.0.1-2: Spurious response for CA

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

7.7A.0.2 Void

7.7A.0.3 Minimum conformance requirements for inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the spurious response are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.7 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.7.3-2 is increased by the amount given by $\Delta R_{IB,c}$ defined in Table 7.3A.0.3.2.1-1.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7A.3.

7.7A.0.4 Minimum conformance requirements for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the spurious response requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in clauses 7.7 and 7.7A.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.7A.1 Spurious response for CA (2DL CA)

7.7A.1.1 Test Purpose

Spurious response for 2DL CA verifies the receiver's ability to receive a wanted 2DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 2DL CA.

7.7A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.1.4 Test Description

7.7A.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.1.4.1 in order to test spurious responses obtained in clause 7.6A.3.1 under the same conditions.

7.7A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.
2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.7A.1.4.3.
3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).
4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.0.1-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6A.3 Out-of-band blocking for CA.

7. Set the downlink signal level according to Table 7.7A.0.1-1 for both carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.7A.0.1-1 + (10log(P_L_{CRB}/N_{RB_alloc}) for PCC, 10log(S_L_{CRB}/N_{RB_alloc}) for SCC) for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex H.2A.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.7A.1.4.2-1: Void

7.7A.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.7A.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.7A.0.1-1 and 7.7A.0.1-2. For the UE which supports inter-band 2DL CA configuration in Table7.3A.0.3.2.1-1, $P_{Interferer}$ power defined in Table 7.7A.0.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7.7A.2 Spurious response for 3DL CA

7.7A.2.1 Test Purpose

Spurious response for 3DL CA verifies the receiver's ability to receive a wanted 3DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.2.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 3DL CA.

7.7A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.2.4 Test Description

7.7A.2.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.2.4.1 in order to test spurious responses obtained in clause 7.6A.3.2 under the same conditions.

7.7A.2.4.2 Test Procedure

Same test procedure as sub-clause 7.7A.1.4.2 with the following exceptions:

Step 1, 2 and 4 of Test Procedure as in clause 7.7A.1.4.2 is replaced by:

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCCs. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

4. Set the downlink signal level according to Table 7.7A.0.1-1 for both carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.7A.0.1-1 + (10log(P_L_{CRB}/N_{RB_alloc}) for PCC, 10log(S_L_{CRB}/N_{RB_alloc}) for SCC) for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

7.7A.2.4.3 Message Contents

Same message contents as sub-clause 7.7A.1.4.3.

7.7A.2.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.7A.0.1-1 and 7.7A.0.1-2. For the UE which supports inter-band 3DL CA configuration in Table 7.3A.0.3.2.3-1, $P_{Interferer}$ power defined in Table 7.7A.0.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.3-1.

7.7A.3 Spurious response for 4DL CA

7.7A.3.1 Test Purpose

Spurious response for 4DL CA verifies the receiver's ability to receive a wanted 4DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.3.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 4DL CA.

7.7A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.3.4 Test Description

7.7A.3.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.3.4.1 in order to test spurious responses obtained in clause 7.6A.3.3 under the same conditions.

7.7A.3.4.2 Test Procedure

Same test procedure as sub-clause 7.7A.2.4.2.

7.7A.3.4.3 Message Contents

Same message contents as sub-clause 7.7A.1.4.3.

7.7A.3.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.7A.0.1-1 and 7.7A.0.1-2.For the UE which supports inter-band 4DL CA configuration in Table 7.3.2_1.3-1 and Table 7.3A.0.3.2.4-1, $P_{Interferer}$ power defined in Table 7.7A.0.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.2_1.3-1 and Table 7.3A.0.3.2.4-1.

7.7B Spurious response for NR-DC

For inter-band NR-DC configurations, the spurious response for the corresponding inter-band CA configuration as specified in clause 7.7A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.7A.

7.7D Spurious response for UL MIMO

7.7D.1 Test Purpose

Spurious response verifies the ability of the UE that support UL MIMO to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking for UL MIMO limit as specified in sub-clause 7.6D.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7D.2 Test Applicability

This test applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.7D.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.7.3 shall be met with the UL MIMO configurations specified in Table 6.2D.1.4.1-1 in Clause 6.2 D.1 UE maximum output power for UL MIMO. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmitter antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7D.

7.7D.4 Test Description

7.7D.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6D.3.4.1 in order to test spurious responses obtained in clause 7.6D.3 under the same conditions.

7.7D.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Test Configuration Table 7.6D.3.4.1-1 in Clause 7.6D.3. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Test Configuration Table 7.6D.3.4.1-1 in Clause 7.6D.3. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0_1 is specified with condition 2TX_UL_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.
3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6D.3.4.2.
4. Set the downlink signal level according to the Table 7.7.5-1 or 7.7.5-1a. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7.5-1a in table 7.7.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.
5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

7.7D.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO.

7.7D.5 Test Requirement

Same test requirement as specified in 7.7.5.

7.7E Spurious response for V2X

7.7E.0 Minimum conformance requirements

7.7E.0.1 General

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency for which a response is obtained, i.e. for which the out-of-band blocking limit as specified in clause 7.6E.3 is not met.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters for the wanted signal as specified in Table 7.7E.0.1-1 and Table 7.7E.0.1-2 for NR V2X bands. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.7E.0.1-1: Spurious response parameters for NR V2X

RX parameter	Units	Channel bandwidth			
		10 MHz	20 MHz	30 MHz	40 MHz
Power in transmission bandwidth configuration	dBm	$P_{REFSENS\_V2X}$ + channel bandwidth specific value below			
	dB	6	9	11	12
NOTE 1: Reference measurement channel is A.7.2					

Table 7.7E.0.1-2: Spurious response for NR V2X

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

7.7E.0.2 Spurious response for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.7E.0.1 shall apply for the NR sidelink reception in the operating Bands in Table 5.2E.1-1 and the requirements specified in clause 7.7 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7E.

7.7E.1 Spurious response for V2X / non-concurrent operation

7.7E.2 Spurious response for V2X / con-current operation

7.7F Spurious response for shared spectrum channel access

7.7F.1 Spurious response for shared spectrum channel access

7.7F.1.1 Test Purpose

Spurious response verifies the ability of the UE that supports shared spectrum channel access to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking for shared spectrum channel access as specified in sub-clause 7.6F.3.1 is not met.

7.7F.1.2 Test Applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.7F.1.3 Minimum Conformance Requirements

For spurious responses, the throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.7F.1.3-1 and Table 7.7F.1.3-2. The relative throughput requirement shall be met for any SCS at any other frequency at which a response is obtained i.e. for which the limit as specified in clause 7.6F.3.1 is not met.

Table 7.7F.1.3-1: Spurious response parameters for shared access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below			
	dB	9			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3F.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.					

Table 7.7F.1.3-2: Spurious response for shared spectrum channel access

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7F.1

7.7F.1.4 Test Description

7.7F.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6F.3.1.4.1 in order to test spurious responses obtained in clause 7.6.3 under the same conditions.

7.7F.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.6F.3.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.6F.3.1.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7F.1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6F.3.1.4.2.

4. Set the downlink signal level according to Table 7.7F.1.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.7F.1.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.7F.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.7F.1.5 Test Requirements

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters for the wanted signal as specified in Table 7.7F.1.5-1, and for the interferer as specified in Table 7.7F.1.5-2.

Table 7.7F.1.5-1: Spurious response parameters for shared access bands

RX parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
Power in transmission bandwidth configuration	dBm	REFSENS + channel bandwidth specific value below			
	dB	9			
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3F.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.					

Table 7.7F.1.5-2: Spurious response for shared spectrum channel access

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

7.7F.2 Intra-band contiguous shared spectrum channel access CA

FFS

7.8 Intermodulation characteristics

7.8.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal

7.8.2 Wide band Intermodulation

7.8.2.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.8.2.3 Minimum conformance requirements

The wide band intermodulation requirement is defined using a CW carrier and modulated NR signal as interferer 1 and interferer 2 respectively.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.2.3-1 for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz and Table 7.8.2.3-2 for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.8.2.3-1: Wide band intermodulation parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

Rx parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
P_w in Transmission Bandwidth Configuration, per CC[5]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
$P_{Interferer\ 1}$ (CW)	dBm	-46		
$P_{Interferer\ 2}$ (Modulated)	dBm	-46		
$BW_{Interferer\ 2}$	MHz	5		
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 7.5 / +BW/2 + 7.5		
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.				
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).				
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.				
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.				
NOTE 5: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.				

Table 7.8.2.3-2: Wide band intermodulation parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 6dB
$P_{Interferer\ 1}$ (CW)	dBm	-46
$P_{Interferer\ 2}$ (Modulated)	dBm	-46
$BW_{Interferer\ 2}$	MHz	BW
$F_{Interferer\ 1}$ (Offset)	MHz	-2BW / +2BW
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.		
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).		
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.		
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.		

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8.2.

7.8.2.4 Test description

7.8.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8.2.4.1-1: Test Configuration Table

<table>
<tr><th colspan="5">Default Conditions</th></tr>
<tr><td colspan="2">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="2">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Mid range (NOTE 4)</td></tr>
<tr><td colspan="2">Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Lowest, Mid, Highest
Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3)</td></tr>
<tr><td colspan="2">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">Highest</td></tr>
<tr><th colspan="5">Test Parameters</th></tr>
<tr><th></th><th colspan="2">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>Mod'n</th><th>RB allocation</th><th>Mod'n</th><th>RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>NOTE 1</td><td>DFT-s-OFDM QPSK</td><td>NOTE 1</td></tr>
<tr><td colspan="5">NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.
NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.
NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5.4.3.

7.8.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.8.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.8.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8.2.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8.2.5-1 for at least the duration of the Throughput measurement, where:

    - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

    - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

4. Set the Interfering signal levels to the values as defined in Table 7.8.2.5-1 and frequency below the wanted signal.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with DFT-s-OFDM condition in Table 4.6.3-118 PUSCH-Config.

7.8.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.2.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8.2.5-1: Wide band intermodulation parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

Rx parameter	Units	Channel bandwidth (MHz)		
		5, 10	15	20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
P_w in Transmission Bandwidth Configuration, per CC[5]	dBm	REFSENS + 6 dB	REFSENS + 7 dB	REFSENS + (9 + $10\log_{10}(BW_{Channel}/20)$) dB
$P_{Interferer\ 1}$ (CW)	dBm	-46		
$P_{Interferer\ 2}$ (Modulated)	dBm	-46		
$BW_{Interferer\ 2}$	MHz	5		
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 7.5 / +BW/2 + 7.5		
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$		

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.
NOTE 5: $10\log_{10}(x)$ is rounded to the next higher 0.5dB value.

Table 7.8.2.5-2: Wide band intermodulation parameters for NR bands with $F_{DL\_low} \geq$ 3300 MHz and $F_{UL\_low} \geq$ 3300 MHz

Rx parameter	Units	Channel bandwidth (MHz)
		10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 6dB
$P_{Interferer\ 1}$ (CW)	dBm	-46
$P_{Interferer\ 2}$ (Modulated)	dBm	-46
$BW_{Interferer\ 2}$	MHz	BW
$F_{Interferer\ 1}$ (Offset)	MHz	-2BW / +2BW
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

Table 7.8.2.5-3: Void

7.8A Intermodulation characteristics for CA

7.8A.1 General

7.8A.2 Wide band Intermodulation for CA

7.8A.2.0 Minimum conformance requirements

7.8A.2.0.1 Wide band Intermodulation for Intra-band contiguous CA

Table 7.8A.2.0.1-1: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	NR CA bandwidth class		
		BC	C	D
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 10	REFSENS + 6	REFSENS + 13.8
$P_{Interferer\ 1}$ (CW)	dBm	-46		
$P_{Interferer\ 2}$ (Modulated)	dBm	-46		
$BW_{Interferer\ 2}$	MHz	$BW_{Channel_CA}$20	$BW_{Channel\_CA}$	50
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}$-30 / F_{offset}+30	-2$BW_{Channel_CA}$ / +2$BW_{Channel_CA}$	$-F_{offset}$-75 / F_{offset}+75
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the closest carrier. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.				

Table 7.8A.2.0.1-2: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

Rx parameter	Units	NR CA bandwidth class	
		B	C
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 16	REFSENS + 19
$P_{Interferer\ 1}$ (CW)	dBm	-46	-46
$P_{Interferer\ 2}$ (Modulated)	dBm	-46	-46
$BW_{Interferer\ 2}$	MHz	5	5
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}$-7.5 / F_{offset}+7.5	$-F_{offset}$-7.5 / F_{offset}+7.5
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$	2*$F_{Interferer\ 1}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

7.8A.2.0.2 Wide band intermodulation for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.8.2 and 7.8A.2.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

7.8A.2.0.3 Wide band Intermodulation for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.8 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8.2.3-1 and 7.8.2.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8A.2.

7.8A.2.1 Wide band Intermodulation for CA (2DL CA)

7.8A.2.1.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8A.2.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.8A.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8A.2.0.

7.8A.2.1.4 Test description

7.8A.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.8A.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8A.2.1.4.1-1: Test configuration table for Intra-band contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.		Highest N_{RB_agg} NOTE 3			
Test SCS as specified in Table 5.3.5-1		Highest			
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested. NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.					

Table 7.8A.2.1.4.1-2: Test configuration table for Inter-band CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 4		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg} NOTE 5		
Test SCS as specified in Table 5.3.5-1			Highest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	Full RB[1]	Full RB[1]	DFT-s-OFDM QPSK	REFSENS[2]
NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3. NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 4: Test frequency is set to Mid Range PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. NOTE 5: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

Table 7.8A.1.4.1-3: Test configuration table for Intraband non-contiguous CA

Default Conditions					
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			NOTE 1		
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg}, NOTE 1, NOTE 3		
Test SCS as specified in Table 5.3.5-1			Highest		
Test Parameters					
	Downlink Configuration			**Uplink Configuration**	
Test ID	**CC Mod'n**	**PCC RB allocation**	**SCC RB allocation**	**CC Mod'n**	**PCC RB allocation**
1	CP-OFDM QPSK	NOTE 1	NOTE 1	DFT-s-OFDM QPSK	NOTE 1
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.1.4.1-3. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested.					

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.8A.2.1.4.1-1, Table 7.8A.2.1.4.1-2 or Table 7.8A.2.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.8A.2.1.4.3.

7.8A.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.8A.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.8A.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.8A.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Interfering signal levels to the values as defined in Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2 and frequency below the CA Band for intra-band CA, or below the SCC's operating band for inter-band CA according to Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2, using a modulated interferer bandwidth as defined in Annex D of the present document. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.1.5.3-1 and 7.8A.2.1.5.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above the CA Band for intra-band CA, or above the SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8A.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.8A.2.1.5 Test requirement

7.8A.2.1.5.1 Wide band intermodulation for Intra-band contiguous CA

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8A.2.1.5.1-1 or 7.8A.2.1.5.1-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8A.2.1.5.1-1: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	NR CA bandwidth class	
		B	C
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 10	REFSENS + 6
$P_{Interferer\ 1}$ (CW)	dBm	-46	
$P_{Interferer\ 2}$ (Modulated)	dBm	-46	
$BW_{Interferer\ 2}$	MHz	20	$BW_{Channel\_CA}$
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}-30$ / $F_{offset}+30$	$-2BW_{Channel\_CA}$ / $+2BW_{Channel\_CA}$
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$	
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the closest carrier. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.			

Table 7.8A.2.1.5.1-2: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

Rx parameter	Units	NR CA bandwidth class	
		B	C
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 16	REFSENS + 19
$P_{Interferer\ 1}$ (CW)	dBm	-46	-46
$P_{Interferer\ 2}$ (Modulated)	dBm	-46	-46
$BW_{Interferer\ 2}$	MHz	5	5
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}$-7.5 / F_{offset}+7.5	$-F_{offset}$-7.5 / F_{offset}+7.5
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$	$2*F_{Interferer\ 1}$

NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

7.8A.2.1.5.2 Wide band intermodulation for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each carrier as specified in subclause 7.8.2 for each component carrier respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in Table 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2.

7.8A.2.1.5.3 Wide band intermodulation for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in Table 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2.

Table 7.8A.2.1.5.3-1: Wide band intermodulation parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

Rx parameter	Units	Channel bandwidth											
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + channel bandwidth specific value below											
		6	6	7	9	10	11	12	13	14	15	15	16
$P_{Interferer\ 1}$ (CW)	dBm	-46											
$P_{Interferer\ 2}$ (Modulated)	dBm	-46											
$BW_{Interferer\ 2}$	MHz	5											
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 7.5 / +BW/2 + 7.5											
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$											

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.1.5.3-1 and 7.8A.2.1.5.3-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.1.5.3-2: Wide band intermodulation parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	Channel bandwidth							
		10 MHz	20 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 6							
$P_{Interferer\ 1}$ (CW)	dBm	-46							
$P_{Interferer\ 2}$ (Modulated)	dBm	-46							
$BW_{Interferer\ 2}$	MHz	BW							
$F_{Interferer\ 1}$ (Offset)	MHz	-2BW / +2BW							
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$							

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

7.8A.2.2 Wide band Intermodulation for CA (3DL CA)

7.8A.2.2.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8A.2.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.8A.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8A.2.0.

7.8A.2.2.4 Test description

7.8A.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.8A.2.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the

OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8A.2.2.4.1-1: Test configuration table for CA

<table>
<tr><th colspan="6">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Intra-band contiguous: Mid range
Inter-band: NOTE 3
Intra-band contiguous + Inter-band: NOTE 3
Intra-band non-contiguous + Inter-band: NOTE 3</td></tr>
<tr><td colspan="3">Test CC Combination setting (N_{RB_agg}) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="3">Highest N_{RB_agg}
(NOTE 4)</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">Highest</td></tr>
<tr><th colspan="6">Test Parameters</th></tr>
<tr><th></th><th colspan="3">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCCs RB allocation</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><th colspan="6">Default Test Settings for a CA_nXD Configuration (Intra-band contiguous)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB[1]</td><td>Full RB[1]</td><td>DFT-s-OFDM QPSK</td><td>REFSENS[2]</td></tr>
<tr><th colspan="6">Default Test Settings for a CA_nXA-nYA-nZA Configuration (Inter-band)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB[1]</td><td>Full RB[1]</td><td>DFT-s-OFDM QPSK</td><td>REFSENS[2]</td></tr>
<tr><th colspan="6">Default Test Settings for a CA_nXC-nYA, CA_nYA-nXC, CA_nYA-nXB and CA_nXB-nYA Configurations (Intra-band contiguous + Inter-band)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB[1]</td><td>Full RB[1]</td><td>DFT-s-OFDM QPSK</td><td>REFSENS[2]</td></tr>
<tr><th colspan="6">Default Test Settings for a CA_nX(2A)-nYA Configuration
(Intra-band non-contiguous + Inter-band)</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB[1]</td><td>Full RB[1]</td><td>DFT-s-OFDM QPSK</td><td>REFSENS[2]</td></tr>
<tr><td colspan="6">NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.
NOTE 3: The specific test frequencies for PCC and SCCs and Wgap for intra-band non-contiguous are defined in Table 7.3A.2.4.1-1. Only test points verifying non-exceptional REFSENS requirements are used for wide band blocking testing.
NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested.
NOTE 5: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.</td></tr>
</table>

Table 7.8A.2.2.4.1-2: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.8A.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.8A.2.2.4.3.

7.8A.2.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.8A.2.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.8A.2.2.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.8A.2.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Interfering signal levels to the values as defined in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2 and frequency below the CA Band for intra-band CA, or below each SCC's operating band for inter-band CA according to Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2, using a modulated interferer bandwidth as defined in Annex D of the present document. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.2.5.2-1 and 7.8A.2.2.5.2-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of all carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above the CA Band for intra-band CA, or above the each SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8A.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.8A.2.2.5 Test requirement

7.8A.2.2.5.1 Wide band intermodulation for Intra-band contiguous CA

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8A.2.2.5.1-1 or 7.8A.2.2.5.1-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8A.2.2.5.1-1: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	NR CA bandwidth class		
		B	C	D
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 10	REFSENS + 6	REFSENS + 13.8
$P_{Interferer\ 1}$ (CW)	dBm	-46		
$P_{Interferer\ 2}$ (Modulated)	dBm	-46		
$BW_{Interferer\ 2}$	MHz	20	$BW_{Channel\_CA}$	50
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}$-30 / F_{offset}+30	$-2BW_{Channel\_CA}$ / $+2BW_{Channel\_CA}$	$-F_{offset}$-75 / F_{offset}+75
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$		
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the closest carrier. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.				

Table 7.8A.2.2.5.1-2: Wide band intermodulation parameters for intra-band contiguous CA with F_{DL_low} < 2700 MHz and F_{UL_low} < 2700 MHz

Rx parameter	Units	NR CA bandwidth class	
		B	C
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 16	REFSENS + 22
$P_{Interferer\ 1}$ (CW)	dBm	-46	-46
$P_{Interferer\ 2}$ (Modulated)	dBm	-46	-46
$BW_{Interferer\ 2}$	MHz	5	5
$F_{Interferer\ 1}$ (Offset)	MHz	$-F_{offset}$-7.5 / F_{offset}+7.5	$-F_{offset}$-7.5 / F_{offset}+7.5
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$	$2*F_{Interferer\ 1}$
NOTE 1: The transmitter shall be set to 4 dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the 15 kHz SCS. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.			

7.8A.2.2.5.2 Wide band intermodulation for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in Table 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2.

Table 7.8A.2.2.5.2-1: Wide band intermodulation parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

Rx parameter	Units	Channel bandwidth											
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + channel bandwidth specific value below											
		6	6	7	9	10	11	12	13	14	15	15	16
$P_{Interferer\ 1}$ (CW)	dBm	-46											
$P_{Interferer\ 2}$ (Modulated)	dBm	-46											
$BW_{Interferer\ 2}$	MHz	5											
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 7.5 / +BW/2 + 7.5											
$F_{Interferer\ 2}$ (Offset)	MHz	$2{*}F_{Interferer\ 1}$											

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.2.5.2-1 and 7.8A.2.2.5.2-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.2.5.2-2: Wide band intermodulation parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	Channel bandwidth							
		10 MHz	20 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 6							
$P_{Interferer\ 1}$ (CW)	dBm	-46							
$P_{Interferer\ 2}$ (Modulated)	dBm	-46							
$BW_{Interferer\ 2}$	MHz	BW							
$F_{Interferer\ 1}$ (Offset)	MHz	-2BW / +2BW							
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$							

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

7.8A.2.3 Wide band Intermodulation for CA (4DL CA)

7.8A.2.3.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8A.2.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.8A.2.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8A.2.0.

7.8A.2.3.4 Test description

7.8A.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.8A.2.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the

OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8A.2.3.4.1-1: Test configuration table for Inter-band CA

<table>
<tr><th colspan="6">Default Conditions</th></tr>
<tr><td colspan="3">Test Environment as specified in TS 38.508-1 [5] subclause 4.1</td><td colspan="3">Normal</td></tr>
<tr><td colspan="3">Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1</td><td colspan="3">Inter-band : Mid range for PCC and SCCs (NOTE 5)
Intra-band contiguous + Inter-band: Mid range for PCC and SCCs (NOTE 5)
Intra-band non-contiguous + Inter-band: Mid range for PCC and SCCs with maxWGap for Intra-band non-contiguous (NOTE 5)</td></tr>
<tr><td colspan="3">Test CC Combination setting (NRB_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE.</td><td colspan="3">Highest N_{RB_agg}
NOTE 3</td></tr>
<tr><td colspan="3">Test SCS as specified in Table 5.3.5-1</td><td colspan="3">Highest</td></tr>
<tr><th colspan="6">Test Parameters</th></tr>
<tr><th></th><th colspan="3">Downlink Configuration</th><th colspan="2">Uplink Configuration</th></tr>
<tr><th>Test ID</th><th>CC Mod'n</th><th>PCC RB allocation</th><th>SCCs RB allocation</th><th>CC Mod'n</th><th>PCC RB allocation</th></tr>
<tr><td>1</td><td>CP-OFDM QPSK</td><td>Full RB[1]</td><td>Full RB[1]</td><td>DFT-s-OFDM QPSK</td><td>REFSENS[2]</td></tr>
<tr><td colspan="6">NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.
NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.
NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB_agg, only the combination with the highest NRB_PCC is tested.
NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.
NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.</td></tr>
</table>

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.8A.2.3.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.8A.2.3.4.3.7.8A.2.3.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.8A.2.3.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.8A.2.3.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.8A.2.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Interfering signal levels to the values as defined in Table 7.8A.2.3.5.2-1 or Table 7.8A.2.3.5.1-2 and frequency below each SCC's operating band for inter-band CA according to Table 7.8A.2.3.5.2-1 or Table 7.8A.2.3.5.1-2, using a modulated interferer bandwidth as defined in Annex D of the present document. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.3.5.1-1 and 7.8A.2.3.5.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

7. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.8A.2.3.5.2-1 or Table 7.8A.2.3.5.1-2. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8A.2.3.5.2-1 or Table 7.8A.2.3.5.1-2 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above the each SCC's operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8A.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM_PRECODER_ENABLED.

7.8A.2.3.5 Test requirement

7.8A.2.3.5.1 Wide band intermodulation for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in Table 7.8A.2.3.5.1-1 or 7.8A.2.3.5.1-2.

Table 7.8A.2.3.5.1-1: Wide band intermodulation parameters for NR bands with F_{DL_high} < 2700 MHz and F_{UL_high} < 2700 MHz

Rx parameter	Units	Channel bandwidth											
		5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + channel bandwidth specific value below											
		6	6	7	9	10	11	12	13	14	15	15	16
$P_{Interferer\ 1}$ (CW)	dBm	-46											
$P_{Interferer\ 2}$ (Modulated)	dBm	-46											
$BW_{Interferer\ 2}$	MHz	5											
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 7.5 / +BW/2 + 7.5											
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$											

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, $P_{interferer}$ power defined in Table 7.8A.2.3.5.1-1 and 7.8A.2.3.5.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.3.5.1-2: Wide band intermodulation parameters for NR bands with F_{DL_low} ≥ 3300 MHz and F_{UL_low} ≥ 3300 MHz

Rx parameter	Units	Channel bandwidth							
		10 MHz	20 MHz	40 MHz	50 MHz	60 MHz	80 MHz	90 MHz	100 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + 6							
$P_{Interferer\ 1}$ (CW)	dBm	-46							
$P_{Interferer\ 2}$ (Modulated)	dBm	-46							
$BW_{Interferer\ 2}$	MHz	BW							
$F_{Interferer\ 1}$ (Offset)	MHz	-2BW / +2BW							
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$							

NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2.3-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4.
NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).
NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.
NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer.

7.8B Intermodulation characteristics for NR-DC

For inter-band NR-DC configurations, the intermodulation characteristics for the corresponding inter-band CA configuration as specified in clause 7.8A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.8A.

7.8D Intermodulation characteristics for UL MIMO

7.8D.1 General

Intermodulation response rejection for UL MIMO is a measure of the capability of the receiver of an UE that support UL MIMO to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8D.2 Wide band Intermodulation for UL MIMO

7.8D.2.1 Test purpose

Wide band Intermodulation for UL MIMO tests the ability of UE that support UL MIMO to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

An UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.8D.2.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.8 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8D.

7.8D.2.4 Test description

7.8D.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8D.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8D.2.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1		Normal		
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1		Mid range		
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1		Lowest, Mid, Highest		
Test SCS as specified in Table 5.3.5-1		Highest		
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**CP-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.				

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.6 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.8D.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* , Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.8D.2.4.3.

7.8D.2.4.2 Test procedure

Same test procedure as specified in 7.8.2.4.2.

7.8D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX_UL_MIMO.

7.8D.2.5 Test requirement

Same test requirement as specified in 7.8.2.5.

Table 7.8D.2.5-1: Void

7.8E Intermodulation characteristics for V2X

7.8E.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8E.2 Wide band Intermodulation for V2X

7.8E.2.0 Minimum conformance requirements

7.8E.2.0.1 Wide band Intermodulation

The wide band intermodulation requirement is defined using modulated NR carrier and a CW signal as interferer 1 and interferer 2 respectively. The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.8E.2.0.1-1 for NR V2X bands. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.8E.2.0.1-1: Wide band intermodulation parameters for NR V2X

NR band	Rx parameter	Units	Channel bandwidth			
			10 MHz	20 MHz	30 MHz	40 MHz
n38, n47	Power in Transmission Bandwidth Configuration	dBm	$P_{REFSENS\_V2X}$ + channel bandwidth specific value below			
			6	9	11	12
	$P_{Interferer\ 1}$ (CW)	dBm	-46			
	$P_{Interferer\ 2}$ (Modulated)	dBm	-46			
	$BW_{Interferer\ 2}$	MHz	10MHz			
	$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 – 15 / +BW/2 + 15			
	$F_{Interferer\ 2}$ (Offset)	MHz	2 * $F_{Interferer\ 1}$			
NOTE 1: Reference measurement channel is A.7.2 NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used.						

7.8E.2.0.2 Intermodulation for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.8E.2.0.1 shall apply for the NR sidelink reception in the operating Bands in in Table 5.2E.1-1 and the requirements specified in clause 7.8 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8E.

7.8E.2.1 Wide band Intermodulation for V2X / non-concurrent operation

FFS

7.8E.2.2 Wide band Intermodulation for V2X / con-current operation

FFS

7.8F Intermodulation characteristics for shared spectrum channel access

7.8F.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8F.2 Wide band Intermodulation

7.8.2.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8F.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.8F.2.3 Minimum conformance requirements

The wide band intermodulation requirement is defined using a CW carrier and modulated NR signal as interferer 1 and interferer 2 respectively.

Instead of the general wideband intermodulation requirements specified in clause 7.8.2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8F.2.3-1. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.8F.2.3-1: Wide band intermodulation parameters for shared spectrum channel access

Rx parameter	Units	Channel bandwidth			
		20 MHz	40 MHz	60 MHz	80 MHz
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + channel bandwidth specific value below			
		9	12	13.8	15
$P_{Interferer\ 1}$ (CW)	dBm	-46			
$P_{Interferer\ 2}$ (Modulated)	dBm	-46			
$BW_{Interferer\ 2}$	MHz	20			
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 - 30 / +BW/2 + 30			
$F_{Interferer\ 2}$ (Offset)	MHz	2*$F_{Interferer\ 1}$			
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3.2-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer.					

7.8F.2.4 Test description

7.8F.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8F.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8F.2.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Mid range			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Lowest, Mid, Highest			
Test SCS as specified in Table 5.3.5-1	Highest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**CP-OFDM QPSK**	**NOTE 1**	**DFT-s-OFDM QPSK**	**NOTE 1**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3F.2.4.1-2 and Table 7.3F.2.4.1-3. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3F.2.5-2) is used in the test requirements.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.8F.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.8F.2.4.3.

7.8F.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1_1 for C_RNTI to transmit the DL RMC according to Table 7.8F.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0_1 for C_RNTI to schedule the UL RMC according to Table 7.8F.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8F.2.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8F.2.5-1 for at least the duration of the Throughput measurement, where:

   - MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

   - Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

4. Set the Interfering signal levels to the values as defined in Table 7.8F.2.5-1 and frequency below the wanted signal.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8F.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with DFT-s-OFDM condition in Table 4.6.3-118 PUSCH-Config.

7.8F.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8F.2.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8F.2.5-1: Wide band intermodulation parameters for shared spectrum channel access

Rx parameter	Units	Channel bandwidth			
		20 MHz	**40 MHz**	**60 MHz**	**80 MHz**
P_w in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + channel bandwidth specific value below			
		9	12	13.8	15
$P_{Interferer\ 1}$ (CW)	dBm	-46			
$P_{Interferer\ 2}$ (Modulated)	dBm	-46			
$BW_{Interferer\ 2}$	MHz	20			
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 - 30 / +BW/2 + 30			
$F_{Interferer\ 2}$ (Offset)	MHz	$2^*F_{Interferer\ 1}$			
NOTE 1: The transmitter shall be set to 4dB below $P_{CMAX\_L,f,c}$ at the minimum UL configuration specified in Table 7.3F.2.4.1-3 with $P_{CMAX\_L,f,c}$ defined in clause 6.2.4. NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal. NOTE 4: The $F_{interferer\ 1}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and $F_{interferer\ 2}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer.					

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Test purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9.3.

Excess spurious emissions increase the interference to other systems.

7.9.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.9.3 Minimum conformance requirements

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.3-1

Table 7.9.3-1: General receiver spurious emission requirements

Frequency range	Measurement bandwidth	Maximum level	NOTE
30 MHz ≤ f < 1 GHz	100 kHz	-57 dBm	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	
12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz	1 MHz	-47 dBm	2
12.75 GHz – 26 GHz	1 MHz	-47 dBm	3
NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in Annex C.3.1. NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz. NOTE 3: Applies for Band that the upper frequency edge of the DL Band more than 5.2 GHz.			

The normative reference for this requirement is TS 38.101-1 [2] clause 7.9.

7.9.4 Test description

7.9.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.9.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.9.4.1-1: Test Configuration Table

Default Conditions				
Test Environment as specified in TS 38.508-1 [5] subclause 4.1	Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1	Low range, Mid range, High range (NOTE 4)			
Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1	Highest (NOTE 3)			
Test SCS as specified in Table 5.3.5-1	Highest			
Test Parameters				
	Downlink Configuration		**Uplink Configuration**	
Test ID	**Mod'n**	**RB allocation**	**Mod'n**	**RB allocation**
1	**N/A**	**0**	**N/A**	**0**
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: For n70, highest test channel bandwidth shall be Highest UL / Highest DL according to asymmetric channel bandwidths specified in clause 5.3.6. NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies.				

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.5.1 for TE diagram and section A.3.2 for UE diagram.
2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.
4. The DL and UL Reference Measurement channels are set according to Table 7.9.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5.4.3.

7.9.4.2 Test procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.
2. Repeat step 1 for all NR Rx antennas of the UE.

7.9.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.9.5 Test requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1.

Table 7.9.5-1: General receiver spurious emission requirements

Frequency range	Measurement bandwidth	Maximum level	NOTE
30 MHz ≤ f < 1 GHz	100 kHz	-57 dBm	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	
12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz	1 MHz	-47 dBm	2
12.75 GHz – 26 GHz	1 MHz	-47 dBm	3
NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in Annex C.3.1. NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz. NOTE 3: Applies for Band that the upper frequency edge of the DL Band more than 5.2 GHz.			

7.9A Spurious emissions for CA

7.9A.0 Minimum conformance requirements

For inter-band carrier aggregation including an operating band without uplink band，the UE shall meet the Rx spurious emissions requirements specified in subclause 7.9 for each component carrier while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.9A.3.

7.9A.1 Spurious emissions for CA (2DL CA)

7.9A.1.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9A.1.3.

Excess spurious emissions increase the interference to other systems.

7.9A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support inter-band 2DL CA with a DL-only band.

7.9A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.9A.0.

7.9A.1.4 Test Description

7.9A.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR CA bands specified in Table 5.5A.3-1. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in Table 7.9A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.9A.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 38.508-1 [5] subclause 4.1			Normal			
Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1			Low range, Mid range, High range (NOTE 3)			
Test CC Combination setting (N_{RB_agg}) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE.			Highest N_{RB_agg} NOTE 4			
Test SCS as specified in Table 5.3.5-1			Highest			
Test Parameters for CA Configurations						
Ch Configuration / N_{RB_agg}		**Downlink Configuration**			**Uplink Configuration**	
PCC N_{RB}	**SCCs N_{RB}**	**Mod'n**	**PCC & SCC RB allocation**		**Mod'n**	**PCC RB allocation**
100	100	N/A	0	0	N/A	0
NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1. NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. NOTE 3: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same N_{RB_agg}, only the combination with the highest NRB_PCC is tested						

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.5.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.9A.1.4.3.

7.9A.1.4.2 Test Procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133 [19], clause9.3).

4. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement SS sends no uplink scheduling information to the UE.

5. Repeat step 1 for all NR Rx antennas of the UE.

7.9A.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.9A.1.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1.

7.9B Spurious emissions for NR-DC

For inter-band NR-DC configurations, the spurious emissions for the corresponding inter-band CA configuration as specified in clause 7.9A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.9A.